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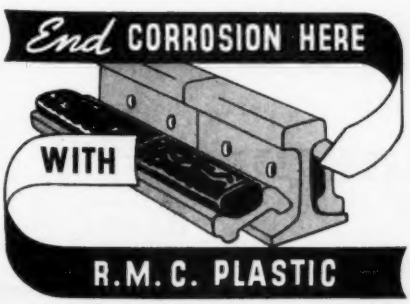
Shield Your RAIL

From RUST

While at the Roadmasters' Convention, stop at our booth, Space 56, and find out for yourself all the facts about R.M.C. Plastic.



With R.M.C. PLASTIC

R.M.C. Plastic provides positive protection against corrosion everywhere within the rail joint area. All the potential danger spots, all those concealed surfaces where Rust sinks its claws, are safely shielded from attack by the metal-preserving compound in R.M.C. Plastic.

The fishing surfaces of joint bar and rail, the shanks and threads of bolts and nuts —all are reached and protected by R.M.C. Plastic. Moreover the method of application insures that all the voids within the joint are packed solidly, completely excluding brine drip and other corrosive agencies.

Your rail joint will give you longer service without attention and will not "freeze" to cause kinked and humped track if you take the necessary steps now to give them this protection with R.M.C. Plastic. Write us today.

RAILWAY MAINTENANCE CORP.

Pittsburgh Pennsylvania

WITH SPRING WASHERS
It's Reactive Power That Counts

. . . and The Hubbard SUPER-SERVICE Gives Most For the Money

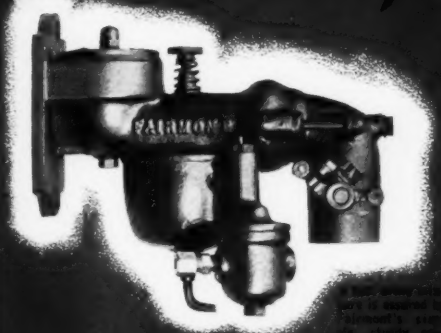
Hubbard SUPER-SERVICE Alloy Spring Washers deliver 121 per cent more reactive protection than spring washers to A. R. E. A. Specifications. You get this extra rail and joint saving protection for a fractional increase in cost per washer but at a lower cost per pound of reaction.

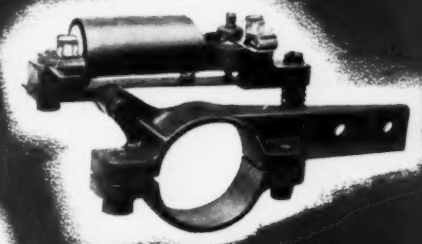
Exhaustive tests have proved that joints bolted with Hubbard SUPER-SERVICE Alloy Spring Washers were not solid or frozen with a bolt tension of 30,000 lbs. Hubbard's SUPER-SERVICE do not go flat at 60,000 lbs. proving that their high reactive power is still working—still effective. As a result of this continuous cushioning protection—wear between rail and joint bars is reduced—rail batter is minimized to the extent that rail and joint bar wear is reduced 80 per cent.

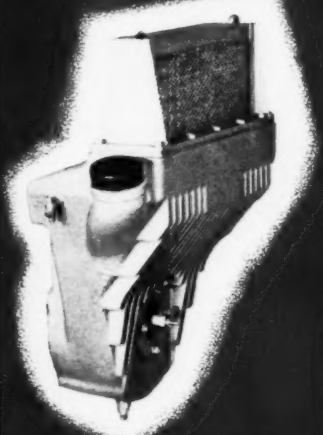
Convince yourself with a trial application on your high speed main line track—crossings—frogs and switches. We will be glad to send a personal representative upon request.

Hubbard and Company
TOOL DEPARTMENT
CHICAGO • PITTSBURGH • NEW YORK

Designed for POWER







FAIRMONT RAILWAY MOTOR CARS HANDLE BIG LOADS ECONOMICALLY

Many advanced features of design give Fairmont cars a large reserve of power for any emergency. Fairmont Ball Bearing and Roller Bearing engines develop a high torque at all usable track speeds, providing a smooth flow of power at low operating cost. They combine light weight, simplified maintenance, and superior durability. Fairmont's popular Endless Cord Belt Drive has proved its greater efficiency and economy by thousands of miles of service under all operating conditions. For further details of the Fairmont line, write Fairmont Railway Motors, Inc., Fairmont, Minn.

FAIRMONT M19 SERIES D. Inspection car. Capacity 4 men. One-man handling. Rear lift 95 lbs. Fairmont OD Ball Bearing Engine (5-8 H.P.).

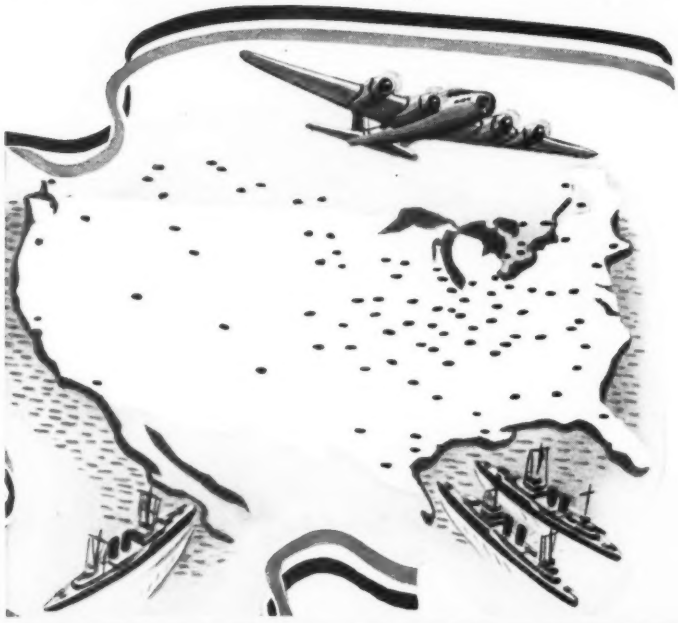
Fairmont

Performance ON THE JOB COUNTS

OF ALL THE CARS IN SERVICE TODAY ★ ★ *More Than Half are Fairmonts*

To build this drainage ditch, 150,000 yards of dirt and rock had to be excavated. International TD-14 TracTracTor with bull-grader, owned by the Texas Mexican Railroad Co., Laredo, Texas, shown clearing the way for the shovel.

Tractor Service "Bases"—Coast to Coast



Like the NAVY, ARMY, and AIR FORCE, TRACTORS Need Bases Too

TRACTORS need "bases," whether they are working for Uncle Sam or for you.

Convenient "bases," with modern service facilities, have long been part of an established after-sale service policy with International Harvester. The complete line of International Industrial Power (TracTracTors, Wheel Tractors, Power Units) is backed by a vast network of Company-owned branches in the United States and Canada. These branches in connection with scores of authorized industrial dealers, provide fast, thorough service to owners and operators of International Industrial Power in all parts of the country.

Ask the nearest International Industrial Power dealer or Company-owned branch about the International Industrial Power line. Write for information.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago, Illinois

INTERNATIONAL Industrial Power

Far less Traffic Delay

Thanks to WELDED CONSTRUCTION which PERMITTED 87½% of this underpass frame TO BE FABRICATED IN THE SHOP

87½% shop fabricated — that's what welded construction permitted in the fabrication of this 250-ton steel frame for a skewed railway crossing over a city street. The remaining 12½%—which consisted of 436 linear feet of welding — was completed on the job in fast time. This speedy construction meant less traffic delay . . . fewer time-consuming detours. Once installed the welded frame assures long years of trouble-free service because the welds were properly made with Airco electrodes and Airco-Wilson Arc Welders. Such welds are strong, dependable, permanent.

Just as Airco products helped speed this job to completion, they can be an important aid to faster fabrication wherever metal must be joined or cut, hardened or softened, descaled or cleaned prior to painting. An engineering service, really worthy of the name, is your assurance of best possible results. Write for full details on any application of the oxyacetylene flame or electric arc.

Air Reduction

General Offices: 60 EAST 42nd ST., NEW YORK, N. Y.

IN TEXAS

MAGNOLIA-AIRCO GAS PRODUCTS CO.

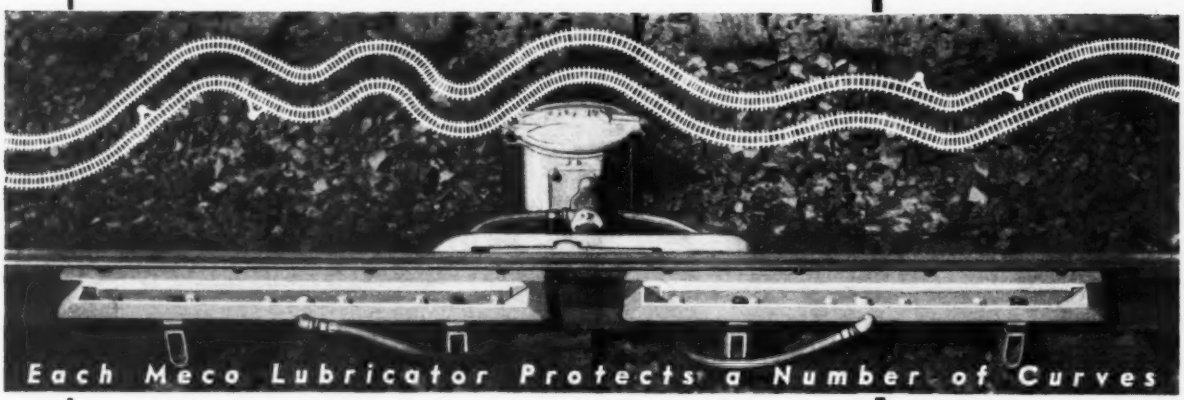
HOUSTON • BEAUMONT • WICHITA FALLS • FORT WORTH • DALLAS • EL PASO • SAN ANTONIO

AIRCO DISTRICT OFFICES IN PRINCIPAL CITIES

AIRCO WILSON

SERVING RAILROADS FROM COAST TO COAST

Effective
LUBRICATION OF DISTANT CURVES



Each Meco Lubricator Protects a Number of Curves

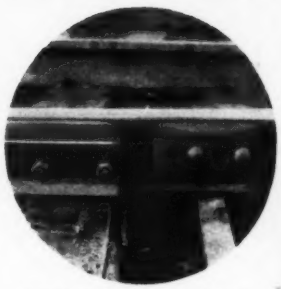
IT'S no rule-of-thumb method that enables our Engineers to avoid the extremes of *under-lubrication* or *over-lubrication* on distant curves, and to locate each Meco where the greatest length of high rail is lubricated—*effectively*.

Based upon our Engineering analysis of your curve charts, and a survey of the curve territory, Mecos are accurately spotted to service the longest curve territory possible and still give distant curves *effective* lubrication.

Performance records on over 4200 installations prove that this engineering service, plus the mechanical excellence of Meco Lubricators, give *effective* protection at lowest annual cost per foot of curve rail.

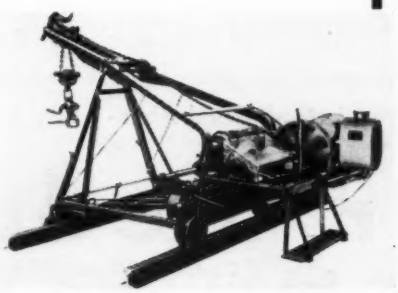
Meco Lubricators

1. Clamped to rail. Can be installed in from 2 to 5 man-hours.
2. Installations made under traffic.
3. No break in track necessary—no train hazards—no flagmen.
4. Can be easily adapted to larger rail at same location.
5. Can be removed and reapplied in another location.
6. Operate satisfactorily in temperatures varying from sub-zero to highest rail temperatures.



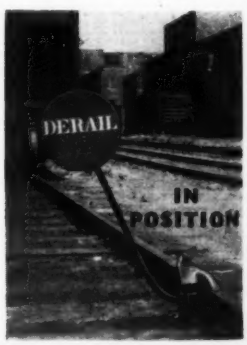
MACK SWITCH POINT PROTECTORS (Reversible)

Lengthen switch point life 8 to 10 times. When wheel contact surface wears down, reversing the Mack gives a new wearing surface. Over 164,000 Mack Switch Point Protectors have been applied on over 100 Railroads.



THE POWER-OPERATED RAIL LAYER

This Power Rail Layer is readily lifted on or off the track . . . lays rails for gang of 120 men or more.



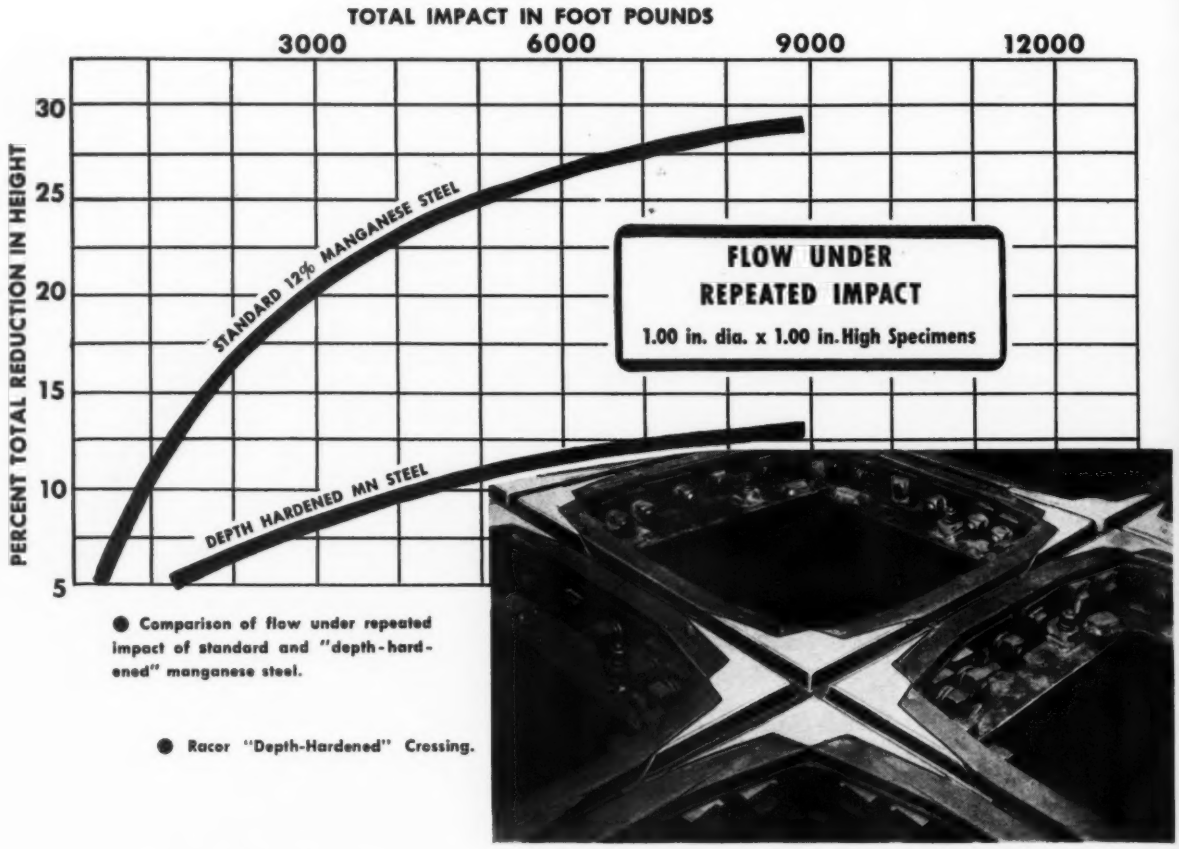
RICHTER BLUE FLAG DERAIL

Portable. Firmly attached by Lever, Hook Bolt and Set Screw.

Exhibiting at Booths 92 & 107—T. S. A.

MAINTENANCE EQUIPMENT COMPANY

RAILWAY EXCHANGE BLDG., CHICAGO



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● Racor "Depth-Hardened" Crossing.

RACOR

"Depth Hardened" Crossings LAST LONGER with LESS MAINTENANCE

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Write for full details

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THE AMERICAN BRAKE SHOE & FOUNDRY CO. • 230 Park Ave., New York

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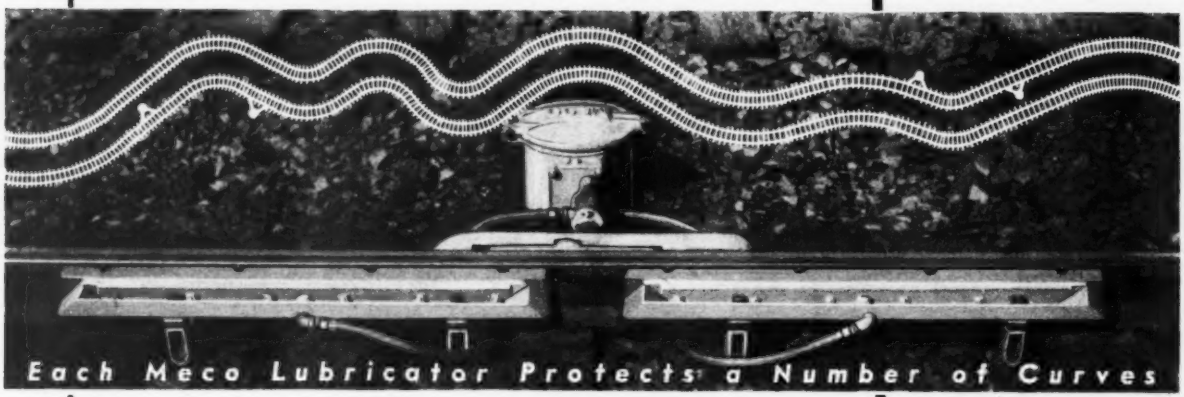

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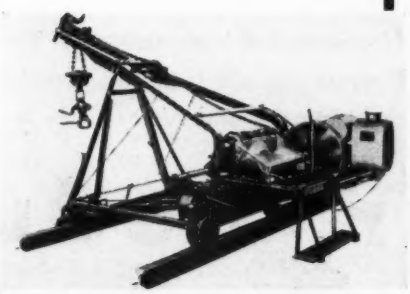

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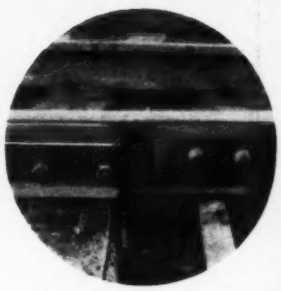

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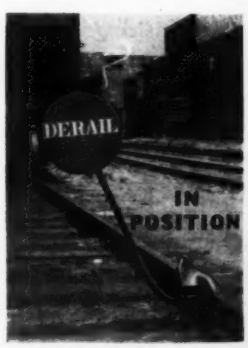

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Exhibiting at Booths 92 & 107—T. S. A.

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RAILWAY EXCHANGE BLDG., CHICAGO

UNIT TYTAMPERS

Do A Better Job Quicker In Out Of Face Or Spot Tamping At Lower First Cost . . . Lower Maintenance Cost.

TRACK SUPPLY ASS'N.
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ROADMASTERS' CONVENTION

NOW ON 75 RAILROADS

Purchase now for 1942 Service

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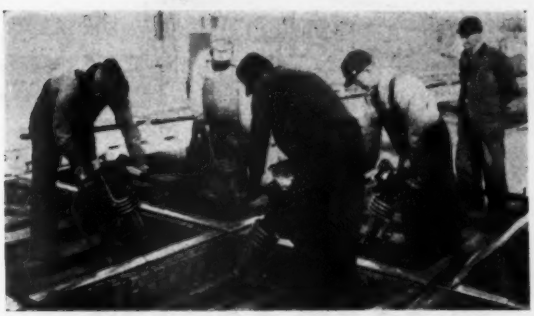
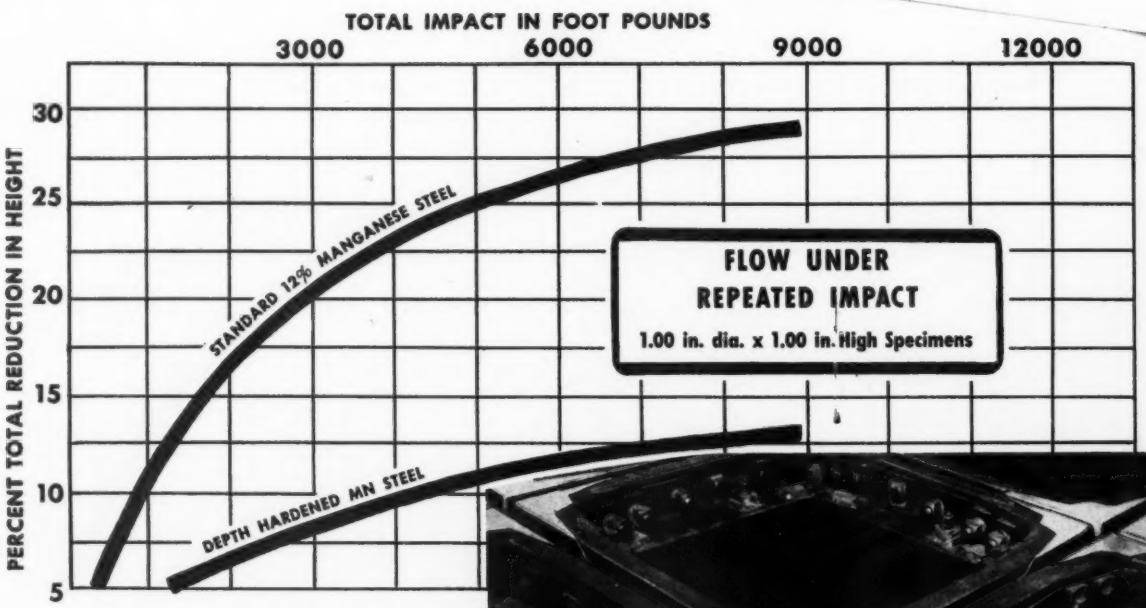


Spot tamping at busy terminals and crossings is quickly and easily handled—no auxiliary equipment in the way.

BARCO Tytampers may also be operated from a small light-weight central power plant for out of face tamping, as shown above. This unit, weighing less than 100 lb., and costing less than $100, is supplying power to 12 BARCO Tytampers.



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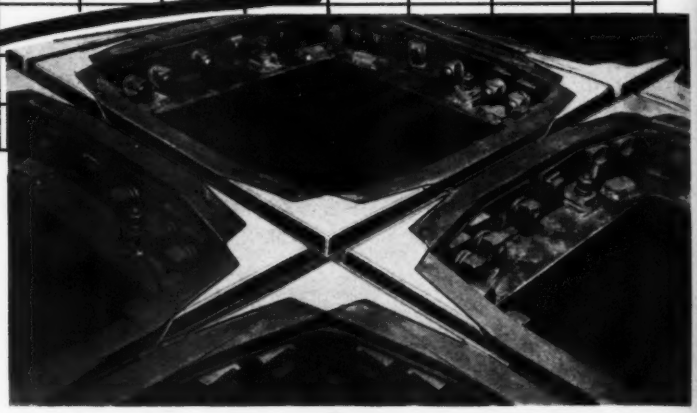

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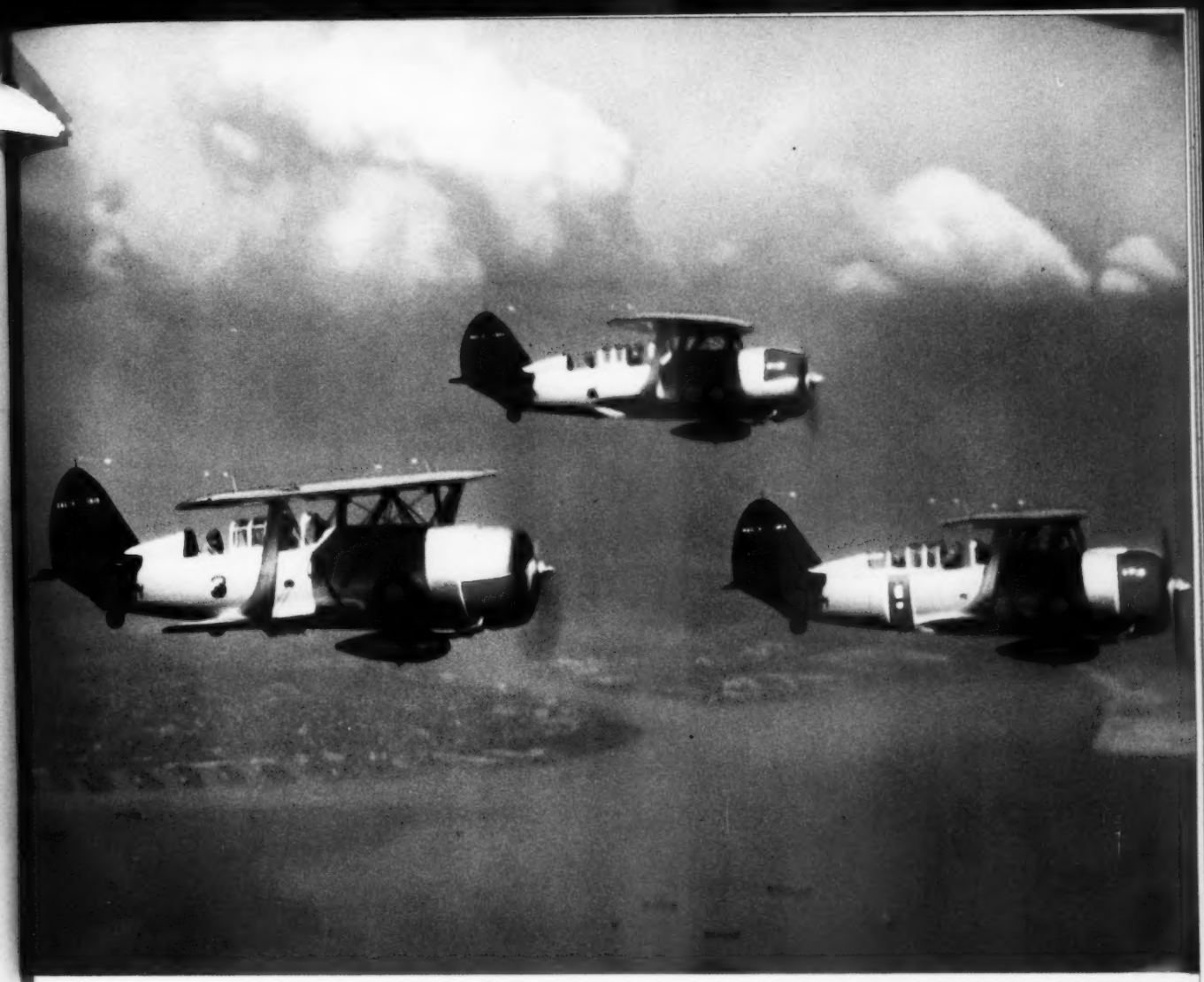

—Official Photograph, Courtesy United States Navy

One proving ground for locomotive packing is in the clouds

When these Navy SBC-4 dive bombers nose over and roar into a power dive, everything in these motors must be working exactly right.

When the Diesels on one of your streamlined trains settles down into a straight-away at 85 miles an hour, everything must be working right there, too.

The skill, and accuracy and experience which the American Hammered Piston Ring Division of Koppers has acquired in turning out millions of rings for United States Navy aircraft and for other aviation engines is one of the reasons it has been able to do such a spectacular job with railroad ring problems. Mileages as high as 150,000 per set of Diesel rings are regularly obtained by railroads with American Hammered Piston Rings.

American Sectional Bronze-Iron Cylinder Packing is doing an outstanding job on steam engines. In installations where other packing lasted 20,000 to 25,000 miles, American Packing has been averaging more than 100,000 miles and mileages as high as 250,000 are not uncommon.

At times like these, when extra power, extra mileage, extra life is so important to the national interest, increases like this are enormously important.

KOPPERS COMPANY
AMERICAN HAMMERED PISTON RING DIVISION
BALTIMORE, MARYLAND

use KOPPERS products

Did you ever see 15,000,000 tons of coal?

No human eye has ever seen 15,000,000 tons of coal at once . . . yet The Koppers Coal Company has the capacity to produce that much and more in a single year. This means 15,000,000 yearly tons of freight for American Railroads from this one Koppers product alone.

A good customer of the railroads, Koppers is a good supplier too. The list which follows suggests some of the many products available and indicates the variety of engineering information covered by the Koppers Library of Technical Literature . . . information which may prove invaluable to you in your business.

There are now about 70 of these data sheets, folders, booklets, etc. Some of those which are particularly interesting to the railroad field are listed below. Check the coupon for the ones you want . . . or send for the entire list of titles.

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- ☐ "How to Build Water-cooled Roofs"
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- ☐ "Membrane Waterproofing"
- ☐ "Dampproofing"
- ☐ "Tar-base Paints"
- ☐ "Creosote"
- ☐ "Creosote-Coal Tar Solutions"
- ☐ "Crude Naphthalene"
- ☐ "Disinfectants"
- ☐ "Comparative Cost Records on Bridges of Pressure-Treated Timber"
- ☐ "Pressure-Treated Railway Car Lumber"
- ☐ "Pressure-Treated Guard Rail Posts"
- ☐ "Painting of Creosoted Wood"
- ☐ "How to Measure Pressure-Treatments of Timber"
- ☐ "Pressure-Creosoted Poles"
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- ☐ "Road, Driveway and Parking Area Construction with Tarmac"
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- ☐ "Sectional Bronze-Iron Packing for Locomotive Main Cylinders and Valves"
- ☐ "Piston Rings for Compressors"
- ☐ "Piston Rings for Diesel Engines"

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1256 KOPPERS BUILDING · PITTSBURGH, PENNA.

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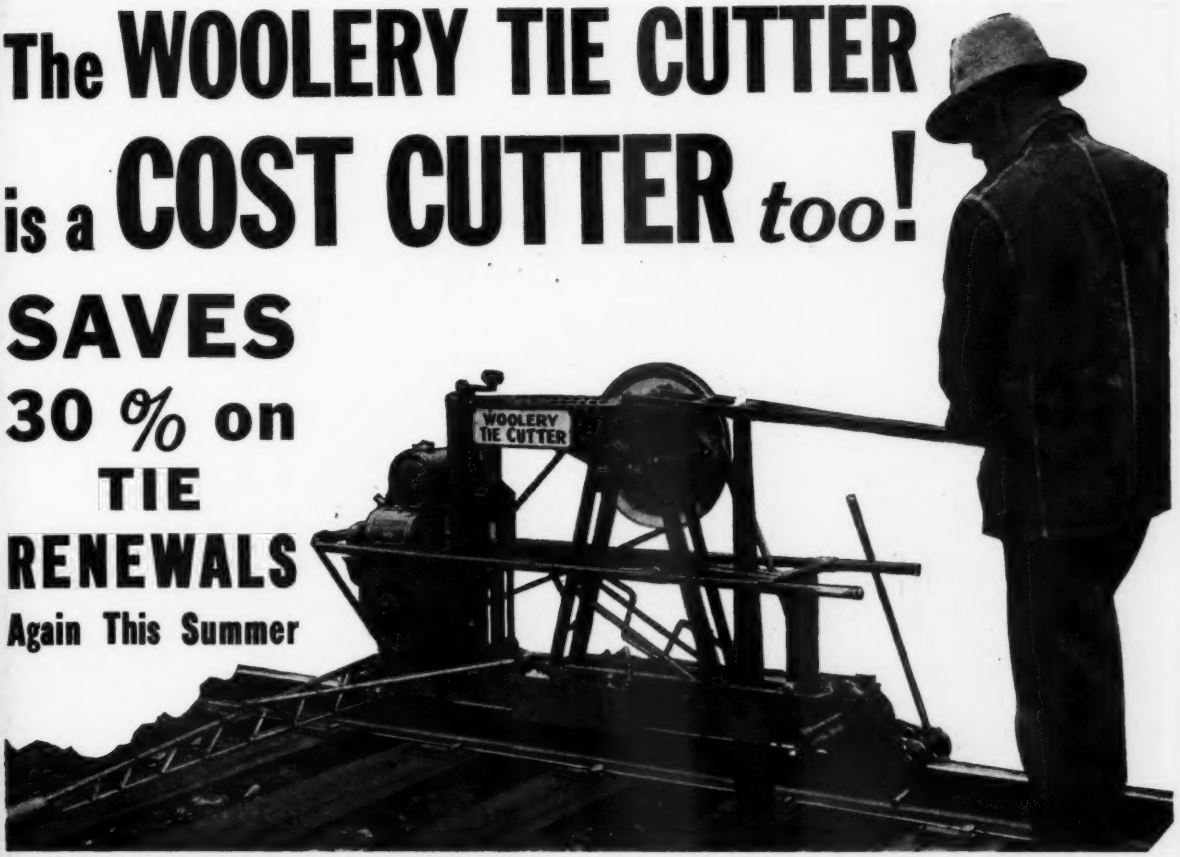
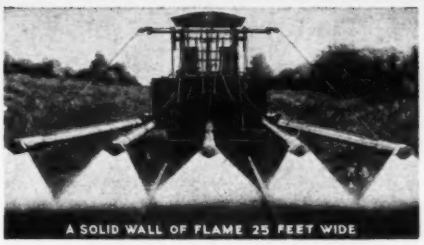
The WOOLERY TIE CUTTER is a COST CUTTER *too*!

SAVES 30 % on TIE RENEWALS Again This Summer




A SOLID WALL OF FLAME 25 FEET WIDE

WOOLERY WEED BURNERS

provide the most economical way to get rid of weeds.

There's a Woolery Weed Burner designed for every job: the Giant Octopus 5- and 3-burner models for main line work, the Midget Octopus 2-burner type for branch lines and around terminals, and the new Junior portable unit for off-track work around buildings. Write us for complete information.

The records of another summer are in.

New figures for tie renewal costs with the Woolery Tie Cutter are available for comparison with the cost of digging them in.

Again, these figures show savings of 30% and more in the actual cost of replacing ties.

Ask to see this added proof that the Woolery Tie Cutter is the most outstanding development yet made to simplify the job, shorten the time required and cut the cost of tie renewals. When you have seen it, you'll want to take steps to reduce your own tie renewal costs next year by using this efficient, modern time- and labor-saving method.

SEE THE TIE CUTTER

on Exhibit at the

Roadmasters' Convention

Spaces A and B.

TRACK SUPPLY ASS'N.
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WOOLERY MACHINE COMPANY

MINNEAPOLIS Pioneer Manufacturers of MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

TIE CUTTERS • SWITCH HEATERS • MOTOR CARS

RAILWAY WEED BURNERS • BOLT TIGHTENERS

No. 153 of a series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

September 1, 1941

Subject: Does Advertising Increase Costs?

Dear Reader:

"There is much opportunity for research into substitutes for materials that have become popular through expensive advertising campaigns, with popular trademarks. While research will indicate that some of them are necessary, it will be found frequently that other materials, having the same qualities but without the trademark and not supported by expensive advertising campaigns, can be made available at a fraction of the cost."

These statements were made by a long-time friend of mine in an address before a group of railway officers a few days ago. Referring as they do to railway materials, they are of concern to every one of you who uses these materials. Are they correct? I don't think they are and I want to tell you why, because they reflect an opinion that is all too widely held by those who purchase and use materials of many kinds.

Advertising is a form of salesmanship. It creates interest in and a desire to buy. As such, it increases the volume of sales. To the extent that advertising brings about this result more cheaply than other means, its expenditure is economical to the manufacturer. And as the volume of sales increases, it is axiomatic that the cost of production decreases, with the result that, in this age of active competition, the cost to the user also declines.

This is the cycle that has made American industry the leader in productive efficiency the world over. It is here that advertising has reached its highest form; it is here that it has exerted its greatest effect in stimulating consumption. None of you will contend, I am sure, that the automobile of today could be produced at today's costs with other than mass-production methods; the large number of smaller companies that have been forced into oblivion testify to this. And you will also concur, I am sure, in the statement that this large production could not have been absorbed without the active campaigns of advertising that the successful companies have conducted through the years. The same is true of washing machines, chewing gum, cigarettes and thousands of other articles of common observation. And the same principles of merchandising apply to products of less widespread utilization, including the materials, tools and equipment that you use.

Those of you whose experience in our field goes back 35 years or more, as mine does, can recall products which were widely, perhaps almost universally, used a generation ago but which are unknown to the younger men today because their promoters made no effort to keep them before us. Conversely, we can all point to other devices and materials that won acceptance quickly because of the aggressiveness with which their merits were brought to our attention.

Maintenance of way operations have made remarkable progress in efficiency in the last quarter century. This progress has been stimulated by the alertness and ingenuity of manufacturers in perfecting improved materials and then by bringing them to your attention until you yourself tried them and proved their superiority. And through all these years, their increased use has led to reduced costs for you.

We are proud to have provided the medium through which so many of these improved devices and materials have been brought to your attention and their use initiated. We are sure that, upon reflection, you will agree that by this means we have not only aided you in reducing the cost of your operations but have assisted in lowering the cost to you of the materials and devices you employed in effecting these economies. In other words, advertising, intelligently done, has served your interests as well as those of the manufacturers.

Yours sincerely,

Elmer T. Howson

ETH:WB

Editor

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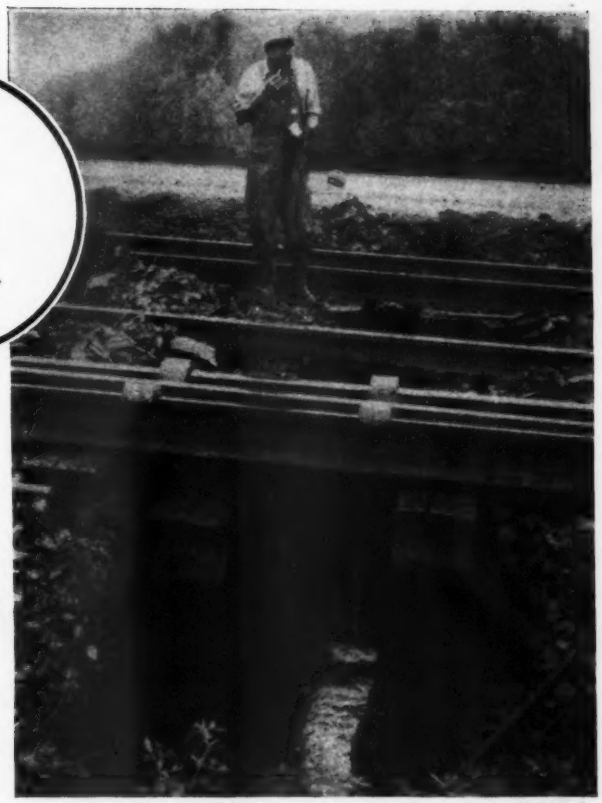
Curing a "Soft Track"

and a recurring source of maintenance

with a U·S·S Metal Culvert



1. A WET SUB-GRADE was a constant source of trouble on this important main line between Chicago and New York. You will note the goodly amount of water remaining in the sub-grade after the excavation was made for the metal culvert.

2. U·S·S CULVERT PARTIALLY INSTALLED. Most of the water has drained out. Notice on the bank the various layers of material showing how the bank has been pushed out from year to year as a result of the soft roadbed.

3. COMPLETED INSTALLATION of U·S·S 8-inch Corrugated Metal Culvert. Bituminous coating assures greater resistance to corrosion. Drain channels leading to culvert have been opened up, causing the increased flow of water.

4. HIGH-SPEED TRAFFIC resumed and another cause of rough roads and heavy maintenance has been eliminated by the simple installation of a U·S·S Pure Iron Culvert. Installation by Young and Greenawalt.

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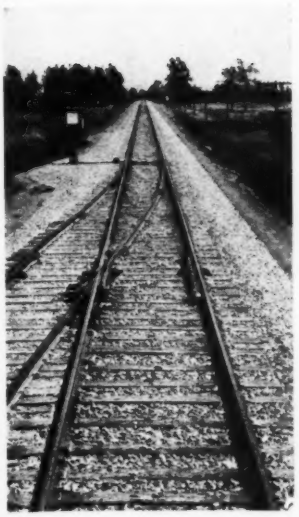
UNITED STATES STEEL



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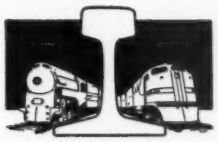
Railway Engineering and Maintenance



Trucks

Modern Highway Juggernauts

EVERY railway employee is aware of the menace of the modern over-the-road truck to the security of his own position by reason of the inroads that it is making on the traffic and the earnings of the railway industry which gives him employment. He may not be so well informed, however, regarding the ramifications of the destructive effects of truck operation in other directions—in menace to human life, in destruction of public investment in our highways, in demoralization of markets, etc. It is only as he comes to appreciate these broader phases of this problem that he finds that he is securing allies in his efforts to bring under control this common enemy of many elements of the public—and, in fact, of the public at large.

This concern is particularly pertinent at the present time when the commercial long-distance trucking industry is endeavoring to secure large appropriations of federal funds for the construction of additional highways under the guise of their need for public defense. This campaign is being waged in the face of statements by the Secretary of War, by the chairman of the House Committee on Public Roads, by officers of the Army Engineer Corps and others in positions of authority that "the highways already constructed for commercial needs and internal development substantially fill national defense needs" and that "military requirements impose no standards for roads or bridges superior to those required for normal commercial traffic."

Truck Accidents

In the study of commercial over-the-road truck operation, the foremost consideration in the public mind is the conservation of human life. Here, highway transportation as a whole has a very black record. In 1940, for illustration, more than 34,500 persons were killed and more than 1,200,000 persons were injured in highway accidents. This slaughter is not confined to any one class of highway vehicle; all types are involved. Yet an undue proportion arise because of the operation of heavy trucks—and this proportion is increasing. In a recent period investigated by the Interstate Commerce Commission, the number of accidents involving contract and carrier trucks, of such character as to require report to the Commission, increased 20 per cent. Furthermore, more than 70 per cent of the trucks involved in these accidents were two-unit vehicles, such as truck-trailer and tractor-semi-trailer types. In not a few of these accidents, the drivers were reported to be asleep at the time. Such a menace constitutes a challenge to their continued use of the highways.

Further anlysis of these accidents sheds additional light on conditions prevailing among these trucks. In an effort to determine the condition of the trucks operating in common carrier service on the public highways, the Bureau of Motor Carriers of the I.C.C. made extensive brake performance tests, which showed that only 42 per cent of the two-axle trucks met the Commission's braking-distance requirements, while only a little over 20 per cent of the tractor-semi-trailer and only a little more than 10 per cent of the truck-full-trailer combinations met these requirements. To railway men accustomed to little short of perfect compliance with the Commission's saftey regulations, such wholesale departure appears scandalous. It goes far to demonstrate one reason for the wholesale slaughter that occurs on the public highways. The need for and the method of correction are obvious.

Truck Destruction of Highways

Second in importance only to human life in public interest is the destruction of highways resulting from truck operation thereon. Bearing on this destruction is a statement issued this year by the Highway Department of Minnesota that whereas 75 per cent of the mileage of the main trunk system of highways in that state was adequate for the traffic it was called on to bear as recently as 8 years ago, only 36 per cent of the state's mileage is in this condition today. This is a sorry picture; yet it is duplicated in many, perhaps most, states. What part of this destruction are the trucks reimbursing the states for? Here one must search carefully for the facts.

In statements published recently, the American Trucking Association claimed that trucks pay taxes each month sufficient to build 1,600 miles of new highways which, at $20,000 per mile, would aggregate $32,000,000. The inference was that these payments are made by over-the-road trucks; yet analysis shows clearly that such figures can be reached only by including farm, local delivery and transfer trucks. Furthermore, 80 per cent of all taxes paid by trucks come from those of 3 tons or less, which are not the type of trucks engaged in commercial transportation of freight.

Furthermore, in spite of the fact that it is the large trucks, with their heavy loads that are destroying the highways, data published recently shows that the smaller

trucks pay as much as 50 per cent *more* in taxes per ton-mile than the large commercial over-the-road trucks. Nor will these latter trucks willingly pay their full share. On the superhighway between Harrisburg, Pa., and Pittsburgh, on which tolls are levied to pay maintenance and carrying charges, the advance estimates indicated that truck use would approximate one-fourth the passenger car use; yet experience shows that the trucks are refusing to pay their toll, with the result that the revenues from trucks is only one-twentieth as large as from the passenger cars. Even more pertinent is the effort of the truck users to boycott the use of this highway until they are given toll rates *lower* than those that are now being paid by passenger cars.

Truck License Fees Inadequate

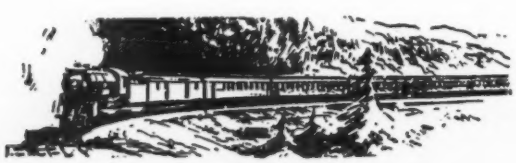
In the face of this propaganda, the public is gradually coming to realize that the heavy over-the-road truck is falling far short of compensating the public for the destruction caused its highways. This was first brought to light by studies of highway use and deterioration made by the State Highway Department of Illinois a couple of years ago. This conclusion was confirmed a short time later by a similar study made by highway officials in Missouri. In Iowa, a more recent study by state officers showed that truck payments are so inadequate in comparison with the destruction they cause that about 40 per cent of the payments now being made for highway purposes by passenger automobiles constitute subsidies to these trucks. Similarly, in Utah it has been found that the trucks in that state are subsidized to the extent of $1,094,552 a year, this subsidy amounting to upwards of $700 a year for trucks heavier than 9 tons, unladen weight. It was found, furthermore, that if the trucks in that state were to pay their full share of highway costs, their payments would amount to 4.1 mills per ton-mile. These studies, all of which are made by public officers supposedly sympathetic with highway use and all of which reach the same conclusion, demonstrate an awakening to a situation that is heartening.

And if the present loads are not sufficiently destructive, it is interesting to note that trucking interests are actively at work in a number of states to increase the maximum permissible weights, lengths and widths to increase still further the loads placed on the highways and the destruction resulting therefrom.

Trucks Demoralize Markets

At a time when all business is being subjected to demoralization from new and unexpected sources, the truck is adding materially to this demoralization in many lines. Not only is it demoralizing freight rate structures, but it is dumping produce on flooded markets in ways that completely demoralize the price structure. According to Motor Truck Facts, 38,230 carloads (or 764 trainloads of 50 cars each) of citrus fruits and vegetables were transported from the state of Florida to 32 states in a recent season via itinerant and privately-owned trucks.

The effect of such movements on the markets is illustrated in an open letter which 30 wholesale vegetable and fruit produce dealers of St. Louis addressed to growers and shippers of the lower Rio Grande Valley, in which it was stated that "time after time during this and recent seasons the market price has been set by the amounts some trucker was willing to take for his load and not by what the dealers and buyers knew the fruit to be worth. Truckers dump their loads when they reach a market that is amply supplied, hoping to cover their losses by obtaining a pay load on their return trip."



Trucks a Public Menace

This is the situation confronting the public today. With expenditures for streets and highways now $400,000,000 a year (or more than $1,000,000 a day) *larger* than in 1929, our system of highways is on the verge of collapse in many areas and comprises more of a problem year by year. This problem will continue until the public becomes sufficiently aroused to demand that these heavy over-the-road freight-carrying trucks be so controlled as to weight, size, standards of construction and maintenance, license and other fees, charges for transportation, and in other respects as are found to be in the public interest.

As the public awakens to the fact that over-the-road operation of trucks on the public highways is not merely a problem of competition for the railways but is equally a problem for it (the public) to face, the railways will gain allies. Railway employees can render an effective service to the public at large as well as to themselves by emphasizing these considerations.

Short Lengths

Of Lumber Reduce Building Costs

BUILDING activities on the railways have taken a turn for the better, and programs for both construction and maintenance are now larger than at any time during the last 10 years. At the same time the volume of construction undertaken by the Army and Navy to provide for increases in our armed forces, as well as the marked expansion of private and industrial building, have increased the difficulty of obtaining building lumber. It seems pertinent, therefore, to call attention to the possibility of using short lengths of lumber.

Short lumber has always been and still is a problem of the saw mills. Every mill produces some short lumber which must be disposed of, and if this cannot be done, it becomes a loss which must be offset by a higher price for the longer material. The savings that can be realized are indicated by the fact that short lumber can be purchased for $10 to $25 less per thousand than the longer lumber, this differential varying with the kind of wood, the grade of the lumber and the location of the saw mill.

Not long ago some of the lumber associations made an investigation to determine the lengths of boards and framing timbers required in frame buildings. A study in detail of various designs showed that 33 per cent

of the lumber as applied was less than 8 ft. long, and 11 per cent ranged between 8 ft. and 9 ft. in length. In view of this fact, the possibility of including short lumber in all orders, for either maintenance or construction, seems obvious. If a road makes a practice of stocking staple sizes of building lumber and holds this stock for seasoning, this possibility is increased.

In view of the above findings, it would appear that there should be no reason why a stock order cannot include 25 per cent of random lengths from 5 to 8 ft., and 15 per cent from 8 to 10 ft., with the remaining 60 per cent in random lengths from 10 to 16 ft. This will in no wise hamper the maintenance forces, while it allows sufficient latitude to enable the purchasing department to obtain more favorable prices. In this connection, it is easy to forget that if the stock of long lumber runs low, it can be replenished at no greater cost than if the whole order had called for long lumber.

Most foremen and some supervisors are opposed to short lumber, despite the fact that the alternative is to cut the higher-priced material to the same lengths that can be obtained by using the shorter pieces. Where this attitude prevails, it will require some educational effort to convince foremen and supervisors of the advantages of using short lumber for work for which it is adapted. Such an effort will be worth while at any time, but particularly so when building activity is increasing and when mills are having difficulty meeting delivery schedules.

Track Inspection

Must Keep Pace With Enlarging Demands

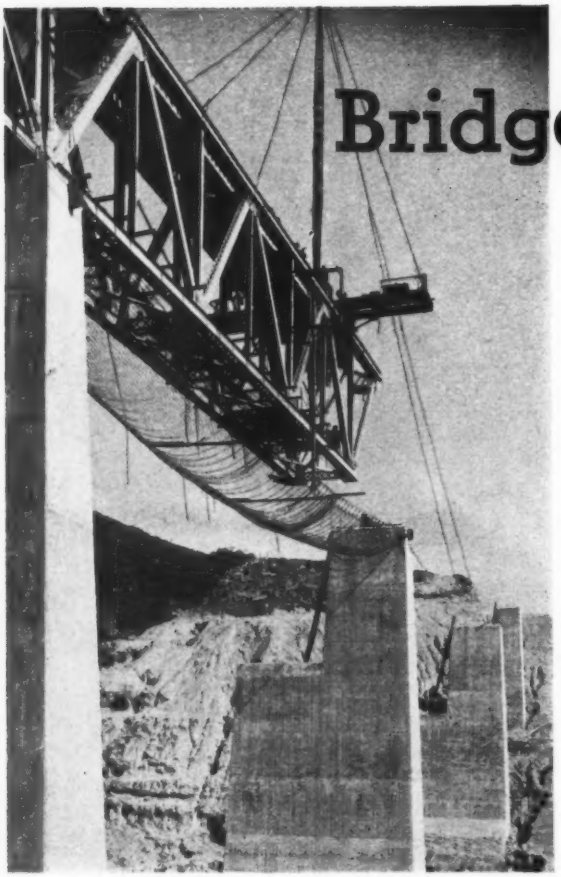
TRACK inspection, like practicaly every other phase of maintenance of way work, has undergone fundamental changes in form and frequency in recent years, and has varied widely on different railroads and, in fact, on different lines of the same road, depending largely upon prevailing local or special conditions. Throughout the recent depression, many roads made fundamental adjustments in their methods and frequency of inspection, especially on less important lines. Possibly the most outstanding of these adjustments was the substitution on many lines of the motor car patrol for trackwalkers, permitting the observation of as much as six or seven times as much track as could be covered by a trackwalker, and possessing other inherent advantages, not the least important of which is the release of many highly skilled trackmen for more productive work on the track.

These were laudable adjustments in the interest of essential economies, and their adequacy is evidenced by the safety records of the roads involved. To have failed to take cognizance of the less intensive train operation at the time and of the increased strength of the track structure generally over earlier days, and to have reflected these in savings through less intensive track inspection than had been considered essential in more active days of the late "twenties," would have been a costly oversight. Changed conditions permitted, if not demanded, the adjustments that were made.

Now the railways are being confronted with new conditions, which have come upon them suddenly. The boom days of the "twenties" in railway traffic are returning; axle loads and speeds have increased and are still increasing. The density of traffic has already been tripled and quadrupled on many lines, and, at the same time, many of these same lines still reflect to a considerable extent the effects of the depression in their rail and ties and standards of maintenance generally. In fact, the very same factors that wisely called for adjustment downward in the intensity of track inspections during the depths of the depression are now developing in the reverse direction, a fact which railway maintenance officers cannot afford to overlook under the pressure of their greatly enlarged work programs and responsibilities.

This question is brought to mind not alone by the rapid recovery that has already been made in railroad traffic during the current year, and the prospect for still more intensive operation in the months immediately ahead, but also by recent accident reports issued by the Interstate Commerce Commission, in at least two of which, covering derailments caused by broken rails at transverse fissures, the Commission questioned the adequacy of the inspection of the track under the conditions prevailing. In one of the derailments, the authorized speed for passenger trains over the track involved was 80 m.p.h., and in the other 62 m.p.h. In the first case, a transverse fissure detector car had not been operated over the track for 13 months, and in the second case, such equipment had never been operated over the territory involved. Again, in the first case, inspection of the track was being confined to two or three times a week, with a special inspection on a motor car on Saturdays, while in the second case, inspection was confined entirely to a motor car inspection about once a week, while operating at a speed of 18 to 20 m.p.h. In both cases, investigation indicated that the condition that had caused the derailment had existed for some time prior to the accident and led to the conclusion that it is probable that the defective condition would have been discovered in time to have averted the accident if more frequent and thorough inspections had been made of the track.

Maintenance of way officers generally need not be told that the threat of the transverse fissure has not been removed, in spite of the outstanding advances that have been made in rail manufacture in recent years, nor that with the increasing density and speed of traffic, some adjustments may be required in their depression inspection practices during the months ahead to insure the full safety of train operation. In fact, some roads have already made such adjustments. However, confronted as they are with the heaviest work programs since 1931, heavy traffic, a shortage of materials and excessively heavy turnover in their forces, all burdensome and distracting, a reminder in this regard is not out of order.



Bridge Construction Features Line

Tells bridgemen at convention of the outstanding features of the eight bridges being built on the 30-mile line diversion of his road around Shasta reservoir, in California, these bridges having a combined length of 12,202 lin. ft. and including the highest double-track, double-deck bridge in the world, Pit River Bridge. Also stresses features of painting*

Erecting One of the Truss Spans of the Second Crossing of the Sacramento River. Note the Safety Net and the Needle Beam; Also the Stepped Piers

Geo. W. Rear

THE Central Valley Project in California, involving the construction of a dam 560 ft. high in the Sacramento River valley about 14 miles above Redding, Cal., has made it necessary to construct at a higher level a 30-mile line diversion of the Shasta route of the Southern Pacific, between San Francisco and Portland, Ore. The relocated lines lies in rough and mountainous territory, and much surveying was required to secure satisfactory alinement and grades.

The old line followed the Sacramento river throughout its canyon and was of reasonably easy construction, but the new line had to be located across side canyons and through or around mountain spurs, with the result that on the 30 miles of new railroad there are 8 major bridges and 12 tunnels, the bridges aggregating 12,202 ft. and the tunnels 19,010 ft. in length. In other words, bridges and tunnels occupy six miles of the 30 miles of railroad. In fact, the six miles of bridges and tunnels are located in 15 miles of the new line.

The cost of the railroad reconstruction is being borne by the United States Bureau of Reclamation and the Bureau has complete charge over the design and construction, in accordance with specifications agreed upon. The line is being constructed to Southern Pacific standards in every detail, and the Southern Pacific checks the plans and maintains a general check of the construction work as it proceeds.

Outstanding Bridges

The new railroad diverges from the present line in the town of Redding, and immediately turns to the east on a four-degree curve. On this curve it crosses the Sacramento river and its bottom lands on a viaduct and deck truss bridge which has a total length of 4,347 ft. The trusses over the river are 169 ft. long and the viaduct on each side has 35-ft. tower girders, with intermediate girders 60 to 100 ft. long. The height over the river is 103 ft., and the rate of grade is 0.8 per cent.

The footings of the river piers and those adjacent rest on shale rock of great depth. All of the piers were built before any of the steel erection was begun and, in general, the viaduct towers were hauled in by trucks and were erected by crawler-mounted cranes from the ground. The longer girders and the truss spans were erected by a locomotive crane from the bridge deck.

Falsework for the erection of the truss spans consisted of steel H-beams driven as piles, above which other steel bents were placed. The steel beams used for piles had punched holes along two sides at close spacing, which permitted attaching caps at any height desired.

Beyond the first crossing of the Sacramento at Redding, the railroad proceeds through a rather open country, until it reaches the vicinity of the Pit River canyon, where it passes through two tunnels, one 2,765 ft. long and the other 2,684 ft. long—with only about 1,000 ft. between them. Emerging from the second tunnel, it comes out on the south side of the Pit River canyon, where the most spectacular bridge on the line is now under construction. This bridge, a double-deck structure, is 3,468 ft. long and 488 ft. above low water in the Pit river. It is for a double-track railroad with a four-

*Abstract of an address presented before the Forty-seventh annual convention of the American Railway Bridge and Building Association, in Chicago.

Change on S.P.

By GEO. W. REAR

Bridge Engineer,
Southern Pacific, Pacific Lines

Erecting the Third Crossing of the Sacramento River. The Falsework Consists of Steel H-Beams Driven as Piles. Bridge Consists of One 200-Ft. Deck Truss Span and Six 90-Ft. Deck Plate Girder Spans

lane highway above. Two of the piers, both located on the sides of the canyon, are 384 ft. in height.

At present, concrete is being poured on every pier in the bridge; several of them being completed. The main span across the canyon is 630 ft. long, and is flanked on each end by an anchor span 497 ft. long. The remainder of the bridge proper on each end is filled out by truss spans, in general, 282 ft. long, with a truss at each end somewhat shorter. The structure will involve the use of 96,000 cu. yd. of concrete and 18,000 tons of steel.

O'Brien Creek Bridge

After passing this bridge, we follow through a very rough country and, after passing through Tunnels 3, 4, 5, 6 and 7, come to O'Brien creek. The bridge here has two 200-ft. deck trusses and six 100-ft. deck girder spans. It involved the use of 13,000 cu. yd. of concrete and 1,425 tons of steel. The spans and all other steel for this bridge were brought in on trucks, there being no railroad within about five miles at the time. The big girders were first set in position under the bridge, and were then picked up and set in place on the piers by a derrick.

A needle beam, about 90 ft. long, placed crosswise of the bridge, was used to take the side guys from the top of the derrick mast. The back guy was run well back, and the forward guy was usually run over to the next abutment. The needle beam was lashed down, generally to the bottom of the pier. In the construction of the piers, large U-bolts were cast in the concrete near the bottom to permit fastening the guys from the needle beam.

Parts of the bridge were used for the one falsework bent employed in erecting each truss span of the O'Brien Creek bridge. In each case the bottom chords were trussed in order to hold them up to camber long enough to make the connection. After the span was connected, the bent was taken out.

Other Bridges

As soon as O'Brien Creek bridge is crossed, the line passes through Tunnel 8, which is 915 ft. long, and then Tunnel 9, close by, which is 1,610 ft. long. It then comes out on Salt Creek canyon, where a bridge will have four 175-ft. deck trusses, three 100-ft. deck plate girders, and four 90-ft. deck plate girders. The substructure for this bridge has been completed for some time, but the plan for its erection contemplates the use of derrick cars, so the erection cannot take place until the track is laid up to one end.

A short distance after passing the Salt Creek bridge, the line passes through Tunnel 10, which is 2,235 ft. long, beyond which it comes out on the Sacramento river again, which it crosses by a bridge 1,040 ft. long and 206 ft. high. This is the Second crossing of the Sacramento, and is the first time we cross back over the original river after having left it at Redding. The trusses of this bridge are 200 ft. long.

Steps incorporated in the piers have a definite purpose. There is a probability that this line may be double-tracked at some time in the future, and as the reservoir will then be full of water, it would be worth millions of dollars in water losses to have to lower the water to permit enlarging the piers from new foundations. Therefore, all of the piers that will be submerged at the ordinary summer level of the reservoir have been built large enough to carry two tracks, to a point sufficiently high to permit them to be extended up for the second track without going too deep under the water—making it unnecessary to empty the reservoir.

Beyond the Second crossing, the line follows more or less open country. We have gotten up on what one might call the summit of the

range, and now follow along about the level of the reservoir, to Doney creek, where the line crosses on a bridge that is 600 ft. long and 160 ft. high. This bridge consists of three 200-ft. continuous truss spans. After these spans were erected, it was necessary to weigh the reactions on the piers and then to shim up the spans to the proper height.

After the Doney Creek crossing, the line crosses the Sacramento river twice before connecting up with the old line at Delta, Cal. The first of these bridges is 758 ft. long and 100 ft. high, and consists of one 200-ft. simple deck truss span and six 90-ft. simple deck plate girder spans. The second of the bridges is 308 ft. long and 67 ft. high, and consists of three 100-ft. simple deck plate girder spans.

The magnitude of the bridges on this line change will be noted from the fact that their construction required the use of 175,500 cu. yd. of concrete and 30,270 tons of steel. The cost of the bridges will be between eight and nine million dollars.

Decks Treated With Chromated Zinc Chloride

On all of the bridges on curves, the ties are bevelled on the top side to provide the superelevation, while spacer blocks are placed between them to prevent their bunching or slewing. Alternate ties are fastened by hook bolts which extend up through the guard timbers, the intermediate ties being fastened with lag screws.

On our bridges we use a gage plate under the tie plate. Through this we secure a much longer life from ties, because of lack of mechanical wear. We consider it poor practice to treat our ties to add to their life, and then wear them out before that life is obtained. All bridges have sidewalks and handrails, the type of handrail being of our own design.

For these bridges, and all other Southern Pacific bridges, chromated-zinc-chloride treatment is given all ties, sidewalks and other timber of the decks. This is to help prevent fires during our long dry spells. We feel that this treatment will prevent ignition of the wood by the usual causes, such as burning tobacco or other burning articles dropped from trains, and by hot brake shoe slivers. The latter are probably new to most of you, but railroads with long, heavy down grades have slivers torn from brake shoes, some of which are red hot and weigh a half pound or more. Under favorable conditions, these readily set fire to track or bridge ties.

Another cause of fires is lighted fusees dropped from trains, but, in general, we can prevent this practice. It does not appear practical to prevent fires starting from certain other causes, but the zinc-treated ties will not maintain fire in themselves.

Structures Carefully Painted

Much attention has been given to the painting of the bridges on the new line, all of which are painted to Southern Pacific standards. I quote from our specifications in this regard.

"After the shop work has been completed and accepted, the surfaces of all structural members and the unfinished surfaces of all castings shall be thoroughly cleaned of all rust, loose mill scale, dirt, oil, grease and other foreign substances, by the use of metal brushes, scrapers, chisels or hammers, or by sandblasting or other effective means satisfactory to the contracting officer. Oil and grease shall be removed by the use of petroleum naphtha.

"After being cleaned, all such surfaces, except surfaces to be in contact with concrete or in field-riveted joints, shall be given a priming coat of paint. Surfaces to be in contact with concrete shall not be painted, but shall be cleaned thoroughly immediately before the concrete is placed. Surfaces to be in contact in field-riveted joints shall be coated with lacquer or other coating material satisfactory to the contracting officer, which will protect the surfaces from rust until the joints are made but which will not form a thick film. Surfaces to be riveted in contact shall be cleaned thoroughly before the parts are assembled. Surfaces not to be in contact, but which will be inaccessible after the parts are assembled, shall be painted before the parts are assembled."

Paint Formulas

The following formulas in our specifications do not agree with some previous reports of the Association and probably not with some of our present reports, but they express our ideas of good work.

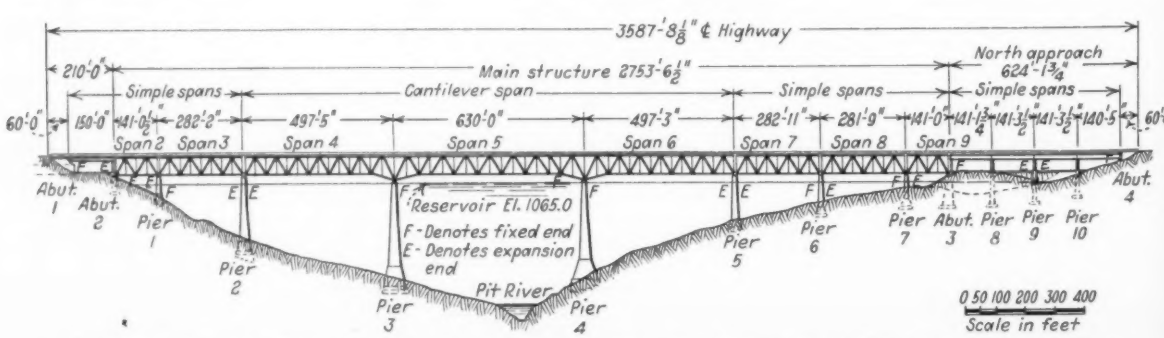
"The paint is to be composed of dry red lead, 33 lb., forming 79.23 per cent of the volume (in other words, the pigment is practically 80 per cent and the vehicle only 20 per cent); raw linseed oil, 1 gal.; turpentine, ½ pt.; and drier, ½ pt.—this total making 1.58 gal., which weighs 41.65 lbs., the weight per gallon being 26.4 lbs.

"The paint shall not be applied when the temperature of the air is below 50 deg. F. No paint shall be applied on damp or frosted surfaces, and materials painted under cover in damp or cold weather shall remain under cover until the paint is dry. The painting shall be performed in a neat and workmanlike manner, and round or oval brushes shall be used. On surfaces which are inaccessible to brushes, the paint shall be applied with sheepskin daubers.

"After erection of the steel superstructure is completed to the satisfaction of the contracting officer, all exposed unfinished metal surfaces shall be painted by the contractor, provided that the surfaces of structural steel upon or against which the concrete of a highway floor is to be placed shall not be painted.

"Care shall be taken in unloading, hauling, handling and erecting the metal parts to preserve the shop coat

(Continued on page 606)



Sketch Elevation of the Double-Deck, Two Track Railroad and Four-Lane Highway Bridge Being Built Over the Pit River

Left—Suburban Tracks of the Illinois Central in Chicago, on Which the Newly-Modified Method of Flame-Straightening Was First Used. Below—The Heat Is Applied to the Lower Half of the Joint Bars at the Center of the Joint

Flame-Straightening Angle Bars in Track

This article describes the early experiments and the present methods used by the Illinois Central to straighten angle bars in the track by the application of heat with welding blowpipes in such a manner as to cause the bars to straighten and bring the joint up to surface

DURING 1940 the Illinois Central straightened the angle bars on approximately 15,000 joints by a flame-straightening process, a modification of a method which it originally tried experimentally about nine years ago. The process is based upon the localized heating of a portion of the angle bar at the center, causing it to straighten itself while cooling.

Early Experiments

About nine years ago, a track supervisor on this road undertook to straighten angle bars without removing them from the track by using welding blowpipes and cocking the bars while hot. In the first experiments, which were made on important yard tracks, large portions of the centers of the angle bars on each joint were heated simultaneously from top to bottom to a medium cherry red and they were then "cocked" slightly by raising with a track jack while the bars were hot. The joint ties were then tamped while the angle bars were cooling. Later, the method was modified in that a strip only about one inch wide was heated from the top to the bottom of the angle bars, and the jack was used as formerly. In 1933, employing the latter method, angle bars on about 5,000 joints were straightened in main line freight tracks in the Chicago terminal.

Since that time, not a single one of the bars of these joints has failed, although they have been subjected to heavy traffic. This service record is all the more remarkable in view of the fact that a few of the angle bars which were straightened had small cracks in their heads at the center at the time they were straightened. Observation has shown that these bars, which were beginning to fail at the time they were straightened, have cracked no further since the treatment.

In the latter part of 1939 it was decided to resume the practice of flame-straightening angle bars, using a further modified process. This decision was made because of low joint conditions in suburban tracks in the Chicago Terminal area, where the tracks had been skeletonized and surfaced out of face on new ballast earlier in the year. Examination showed that bent or drooped angle bars were the cause. After analyzing various methods of correcting this situation, the maintenance department decided that flame-straightening would be the most economical, and, because of the excellent service record given by joints that had been straightened about nine years previously, recommended the new method of flame-straightening developed with the aid of engineers of The Oxweld Railroad Service Company.

Flame-Straightening Method

In this method, the operators use an oxy-acetylene welding blowpipe with a 16-in. tip extension and tips having a rated oxygen capacity of 80 or 100 cu. ft. per hour. Both angle bars of a joint are heated simultaneously with a neutral flame, without loosening the bolts, except that it is advisable to loosen the two middle bolts when the rail ends are considerably drooped. Beginning at the angle or base of the web at the centers of the bars, an area is heated extending up as high as the center

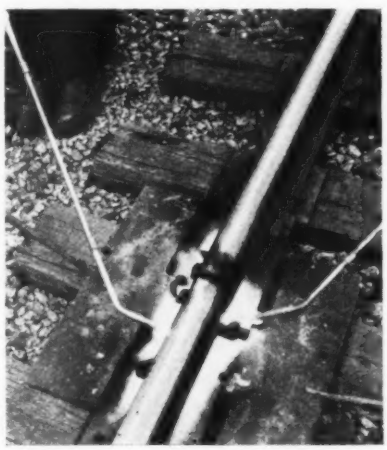
line of the bolt holes and laterally out on the toe of the bar for about 1½ to 2½ in. on each side of the center. This area is heated to a medium cherry red color.

The amount of straightening required is indicated by a 1, 2 or 3 classification of the joints made previously, and the amount of straightening obtained is controlled by the size of the area heated. For those bars requiring the most straightening (marked No. 3), the area heated is about 4 or 5 in. wide at the angle, tapering to nothing at the level of the bolt holes, so that the entire area heated, if projected on a plane, would be more or less triangular. When the angle bars require only a slight amount of straightening (those marked No. 1), the area heated is about 3 in. wide at the angle or base of the web. Those joints marked No. 2 are treated midway between the two extremes described.

In the application of the heat, large-capacity welding blowpipes are used to apply the heat as quickly as possible and thus avoid its distribution or soaking into the other portions of the angle bar. After the bars have been heated, they are allowed to cool naturally in the air. Controlled cooling is not used because it is desirable for the joint to cool quickly enough to be tamped before much traffic has passed over it. The heating and cooling, when properly done, straighten the bars automatically, bringing the joint up to surface. The ties under the joint and on both sides of it then require tamping, which is done by a section gang. In order for the gang that is tamping the joints to keep up with the flame straightening, it is usually necessary to employ a four-man gang with power tampers or a larger gang with hand-tamping tools. It is considered desirable for the gang to stay close behind the heating operators, allowing only sufficient time for the angle bars to cool.

Organization

The force used for flame-straightening work consists of two operators, one helper and three laborers. Their operations are as follows: One of the laborers bends the bonding wires away from the bars and moves other obstructions out of the way. The lead operator or the section foreman measures and classifies the joints, marking them 1, 2 or 3, depending on the amount the angle bars need to be straightened. The operators heat the joints with welding blowpipes, as described. The second laborer handles a push car, dolly or track truck, loaded with cylinders of acetylene and oxygen, and other equipment, and the helper handles the hose, connects cylinders, etc. One man completes the work by bending the bonds back in place and re-oiling the straightened angle bars.



Close-up of a Joint Being Flame-Straightened. Care is Taken Not to Heat the Bars Above the Critical Temperature of the Steel

On out-of-face work, two operators can straighten about 160 joints a day. The production will vary somewhat, depending upon the proportion of badly drooped joints and other factors, such as the density of traffic. The cost varies with the same conditions that affect the production of the gang and usually runs from 24 to 40 cents per joint for material and labor, exclusive of the cost of tamping the ties.

On the Illniois Central, the flame-straightening process is not considered a substitute for building up battered rail-ends by welding rail ends. However, it has been used as a complementary process ahead of rail-end welding, and actual measurements have shown that it reduces by 30 to 50 per cent the amount of such welding required on joints so treated. In addition, flame-straightening is now used by this road coincident with surfacing track. The process is used behind the surfacing work rather than in advance of it, because some spotting of joints is always required after surfacing operations.

Theory of Flame-Straightening

Steel, like most substances, expands when heated and contracts when cooled. However, when it cools, it shrinks to a slightly smaller size than before it was heated. This knowledge has been used for some time in flame-straightening heavy steel members in industrial work and one of its first applications in the railway field was in the straightening of heavy crossing frogs in the shop or factory by heating selected areas on the under side of the frog to bring the upper surface back to a true plane. When the angle bar is heated it expands, and then in cooling the lower portion contracts longitudinally and slightly upsets at the center, thus shortening the lower portion of the bar and automatically pulling the ends down and straightening the bar.

The Illinois Central is so well pleased with the results of its flame-straightening work that, after its use on the suburban tracks to correct the condition previously mentioned, it has expanded this use to all main line tracks in the Chicago Terminal area and, in addition, has done some flame-straightening work on other divisions, straightening a total of approximately 15,000 joints in the year 1940.

This work was done under the direction of L. H. Bond, now retired, chief engineer maintenance of way, with the assistance of engineers of The Oxweld Railroad Service Company.

As Soon as Possible After the Joint Bars Have Cooled Sufficiently, the Ties Under the Joint and On Both Sides of It Are Tamped

Of the Various Classes of Timber Treated in 1940, Crossties Recorded the Greatest Gain, Up 19.3 Per Cent, as Compared to Those Treated in 1939

Volume of Wood Treated Gains 8 1/4 Per Cent in 1940

Responding to accelerated economic conditions and greater industrial activity, the volume of wood given preservative treatment in 1940 increased 8¼ per cent, as compared to 1939, thus continuing the upward trend that the wood preservation industry has been following since 1934, except for the slight setback that occurred in 1938. The volume of wood treated in 1940 has been exceeded in only 8 of the 32 consecutive years that complete records of treatment have been compiled

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IN 1940, wood preservation continued the upward trend which it has followed consistently, beginning in 1934, except for a slight recession in the volume of wood treated in 1938. A total of 265,473,149 cu. ft. of wood was given preservative treatment in 1940, an increase of 20,253,271 cu. ft., or 8.26 per cent, over the quantity treated in 1939, according to figures compiled by R. K. Helphenstine, Jr., Forest Service, United States Department of Agriculture, in co-operation with the American Wood-Preservers' Association. While the volume treated amounted to only 73.3 per cent of the quantity treated in 1929, the peak year for the industry, it was greater than for any year since 1930, except 1937, and has been exceeded in only 8 of the 32 consecutive years that these statistics have been compiled.

For statistical purposes the material treated year by year is divided into eight classes. In 1940, as compared to 1939, only two of these classes showed decreases and the remaining six showed increases, crossties recording the greatest gain and poles the greatest loss in quantity treated.

As in all previous years since the beginning of the wood-preserving industry, the railways maintained their position as the principal consumer of treated timber. Previous to 1939, this position had been assured by the fact that crossties constituted more than 50 per cent of the total volume of timber treated, and only the railways use ties. However, in 1940, as in 1939, crossties fell below 50 per cent of the total volume of wood treated, in spite of the large increase in crossties treated in 1940 as compared to the previous year. When switch ties are added, however, the combined total for 1940 amounts to 51.6 per cent of the total quantity of wood given preservative treatment, as compared to 47 per cent in 1939. When other materials, such as piling, poles, timbers, etc., used by the railways are added, the total approximates 70 per cent of the production in 1940.

Crossties Up 19.3 Per Cent

A total of 42,666,598 crossties were given preservative treatment in 1940, representing a total volume of 127,999,794 cu. ft. or 20,753,259 cu. ft. more than were treated in 1939. Numercially, the increase was 6,917,753 or 19.3 per cent. As in 1939, oak ties ranked first in number with 18,088,395, or slightly more than 42 per cent of the total, as compared to 45 per cent in 1939. Southern pine continued in second place with a large increase from 6,854,726 crossties treated in 1939 to 10,088,434 crossties in 1940, representing almost 24 per cent of the total number treated,

as compared with a little more than 19 per cent in 1939. Douglas fir remained in third place with 4,373,319 crossties treated, accounting for a little more than 10 per cent of the total and gum ties continued in fourth place with 2,691,440 crossties treated, representing about 6 per cent. Other woods included lodgepole pine, ponderosa pine, maple, tamarack, birch, beech, hemlock and elm in the order named, aggregating 15.66 per cent of the total, while 741,635 crossties, or 1.74 per cent, were from other woods.

Crossties (Number) Treated by Kinds of Woods and Kinds of Preservatives—1940

Kind of wood	Creosote (1)	Creosote-petroleum (2)	Zinc chloride (3)	Zinc-meta-arsenite	Wolman salts	Miscellaneous preservatives	Total	Per cent of total
Oak	13,764,088	4,320,687	220	.....	3,400	.....	18,088,395	42.39
Southern pine	6,246,934	3,796,760	44,740	.....	.....	.....	10,088,434	23.65
Douglas fir	41,725	4,044,224	161,186	70,489	13,816	41,879	4,373,319	10.25
Gum	1,984,549	705,617	.....	1,274	.....	.....	2,691,440	6.31
Lodgepole pine	21,488	1,226,140	355,355	.....	.....	.....	1,602,983	3.76
Ponderosa pine	1,666	1,278,370	.....	.....	.....	.....	1,280,036	3.00
Maple	269,879	792,896	310	.....	.....	.....	1,063,085	2.49
Tamarack	8,188	942,910	69,317	.....	.....	.....	1,020,415	2.39
Birch	268,401	541,800	310	.....	.....	.....	810,511	1.90
Beech	221,512	321,271	310	.....	.....	.....	543,093	1.27
Hemlock	4,000	73,415	126,217	.....	.....	.....	203,632	0.48
Elm	43,700	115,920	.....	.....	.....	.....	159,620	0.37
All other	518,674	194,863	6,617	.....	.....	21,481	741,635	1.74
Total	23,394,804	18,354,873	764,582	71,763	17,216	63,360	42,666,598	100.00
Per cent of total	54.83	43.02	1.79	0.17	0.04	0.15	100.00	

(1) Includes distillate coal-tar creosote and solutions of creosote and coal-tar.
(2) Includes various percentage mixtures of creosote and petroleum.
(3) Includes chromated zinc chloride

Of the total number of crossties treated in the year under review, 23,394,804, or 54.8 per cent, were treated with straight creosote or with solutions of creosote and coal tar; 18,354,873 crossties, or 43.0 per cent, were impregnated with mixtures of creosote and petroleum; and 602,976, or 1.41 per cent, were treated with zinc chloride; while all other preservatives accounted for only 0.74 per cent of the total number of crossties given preservative treatment. All crossties reported in 1940 were given pressure treatment.

Of the total number of crossties treated in 1940, 27,450,801, or 64.3 per cent, were bored and adzed prior to treatment, compared with 63 per cent in 1939, 70.5 per cent in 1938 and 70 per cent in 1937; 4,893,286 were bored but not adzed; 464,454 were adzed but not bored; while 9,858,057, or 23.1 per cent, were neither adzed nor bored. In 1939 more than 23 per cent and in 1938 only 21 per cent, of the crossties treated were not adzed or bored.

The quantity of switch ties given preservative treatment in 1940 amounted to 160,309,739 ft. b.m., representing an increase, compared to 1939, of 4,077,976 ft. b.m., or 4 per cent. In this classification also, oak was in first place with respect to the volume treated, the total for this species being 60,651,932 ft. b.m., or 57.05 per cent of all the switch ties treated during the year, as compared to 65 per cent in 1939. Douglas fir remained in second place, with 15,704,362 ft. b.m., or 14.77 per cent of the total treated in 1940, as compared to 11 per cent in 1939; while Southern pine was again in third place with 13,079,931 ft. b.m., or 12.32 per cent, as compared to 10.6 per cent in 1939. Gum accounted for 7,845,401 ft. b.m., or 7.38 per cent; and maple, tamarack and beech followed, with 2.94 per cent, 2.49 per cent and 1.02 per cent, respectively. The remaining 2.03 per cent was made up of birch, lodgepole pine, elm and a few miscellaneous species.

In spite of a very large increase of 70 per cent in treated piles from 1938 to 1939, 1940 recorded another substantial increase, the production in that year amounting to 23,154,902 lin. ft., as compared to 21,655,737 lin. ft. in 1939, or an increase of 7 per cent. This production has been exceeded in only two years, 1929 and 1930. As in other years, Southern pine stood far ahead of other species, with 19,415,052 lin. ft. or 84 per cent; Douglas fir, in second place, trailed with 3,298,016 lin. ft., or 14 per cent; and oak, in third place, totaled only 298,763 lin. ft., or 1.3 per cent. The remainder consisted principally of Norway pine and western red cedar. All piles reported were treated by

(Continued on page 606)

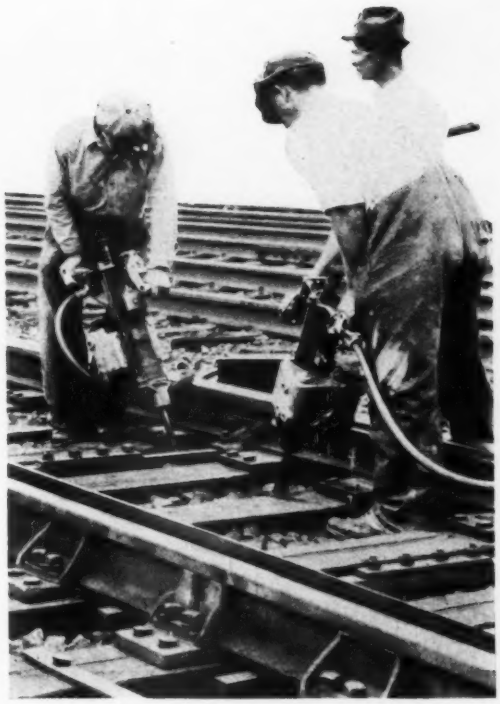
Wood Preservation, 1909-1940
Together with Consumption of Creosote and Zinc Chloride

Year	Total material treated, cu. ft.	Number of crossties treated	Creosote used, gal.	Zinc chloride used, lb.*
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,088	40,260,416	108,373,359	26,466,803
1914	159,582,639	43,846,987	88,764,050	27,212,259
1915	140,858,963	37,085,585	84,065,005	33,269,604
1916	150,522,982	37,469,368	96,079,844	26,746,577
1917	137,338,586	33,459,470	83,121,556	26,444,689
1918	122,612,890	30,609,209	56,834,248	31,101,111
1919	146,060,994	37,567,927	67,968,839	43,483,134
1920	173,309,505	44,987,532	70,606,419	49,717,929
1921	201,643,228	55,383,515	77,574,032	51,375,360
1922	166,620,347	41,316,474	87,736,071	29,868,639
1923	224,375,468	53,610,175	128,988,237	28,830,817
1924	268,583,235	62,632,710	158,519,810	33,208,675
1925	274,474,539	62,563,911	169,723,077	26,378,658
1926	289,322,079	62,654,538	188,274,743	24,777,020
1927	345,685,804	74,231,840	221,167,895	22,162,718
1928	335,920,379	70,114,405	222,825,927	23,524,340
1929	362,009,047	71,023,103	226,374,227	19,848,813
1930	332,318,577	63,267,107	213,904,421	13,921,894
1931	233,334,302	48,611,164	155,437,247	10,323,443
1932	157,418,589	35,045,483	105,671,264	7,669,126
1933	125,955,828	22,696,565	85,180,709	4,991,792
1934	155,105,723	28,459,587	119,049,604	3,222,721
1935	179,438,970	34,503,147	124,747,743	4,080,887
1936	222,463,994	37,952,129	154,712,999	4,127,886
1937	265,794,186	44,803,239	183,574,581	4,833,935
1938	244,221,442	44,598,678	166,183,891	4,829,590
1939	245,219,878	35,748,845	163,864,259	4,522,070
1940	265,473,149	42,666,598	174,625,305	5,180,896

*Includes chromated zinc chloride.

Unit Tie Tampers
In Section Work

The following is abstracted from a report prepared by a committee of the Association of Maintenance of Way Foremen of the Big Four and presented before that organization by Earl Hornbeck, chairman of the committee and extra gang foreman at Crestline, Ohio



"They Are Exceptionally Fine for Tamping Around Switches and Frogs, for They Get Into Places One Cannot Reach With Picks and Tamp Them Well"

SINCE 1930, we have experienced a large reduction in forces. Sections have been eliminated, and the mileage of the remaining sections has been increased to the extent that it became necessary to find some faster means of keeping the track smooth by spot-surfacing. We believe that we have this in the single unit tie tamper. Since 1930, we have not been able to surface our tracks out-of-face as often as we did prior to that time when it was our practice to surface one main track out-of-face one year and the other main track the next year. This kept our track fairly smooth and did not leave much spot-surfacing to be done on track that was not to be tamped that particular year.

When this out-of-face tamping was done on a track about every second year, the tamping pick, with more men and shorter sections, could keep track smooth. But now with less labor and more miles per section, and the track being tamped out-of-face only every four or five years, we have a lot of spot-tamping to do, which requires a faster method of spot-tamping.

Since 1930, we have had less materials (ties, angle bars, bolts, spikes and ballast) than prior to 1930, which also creates rough track, as these materials are all essential to good track. It is true when our supply of materials fell off, we did not require as many men to apply them as before, but this gave us more rough track that had to be put up with picks. This is another reason why the unit tie tamper plays an important part.

These tampers have enabled us to tamp more than three times as many ties on my district as we could tamp with picks. We also do a much better job of tamping. It is not necessary to hunt for stones of a certain size to fit the space under the tie when using a single unit tamper. In new or loose stone, no cleaning outside of the tie is necessary before starting the tamping for these tampers will go to the bottom of the tie and do the work. In muddy ballast we do some cleaning out to get to the bottom of the tie for tamping, but this is done for drainage purposes as well as for convenience in tamping.

We have only three men on each section and line up our force so that one man handles the jack and does any cleaning out that may be necessary; he also does the rough dressing of the track. The other two men keep the tampers going all the time, while the foreman checks his bolts for tightening, and sees that the anchors are bearing against the ties, in addition to spotting up his track and caring for his men's safety. We have found this to be the best organization for a gang of three men.

We have done a lot of stripping of track and use these tampers instead of picks for loosening the ballast, by replacing the tamping tool with a digging tool. We also have 21 railroad crossing frogs to keep in surface on my district, and have found the tampers to be a big help in this work. They are exceptionally fine for tamping around switches and frogs, for they get into places which one cannot reach with picks and tamp them well.

Repairs to these tampers have not yet been so costly since they are new. It is essential that the foreman and men acquaint themselves with the light repairs that may be necessary so that they can repair the tampers and not have them idle waiting until the repairman can get to them. We have been able to do a lot of this small repair work, chiefly through our repairman who points out to us where trouble may arise and shows us how repairs can be made quickly. We also point out to him such troubles as have occurred. He passes the information along to the manufacturer's representative, who arranges for correction. We have already seen some improvements made that eliminated early troubles. All of these measures are necessary to keep the tampers running steadily.

The proper handling of tampers is very important for they can be damaged easily by careless handling. When it becomes necessary to send a tamper to the shop for repairs that cannot be made in the field, we send it by passenger train, having a man load it and another man on hand at the receiving point to unload it. This avoids the possibility of damage by trainmen. We do not experience anv rough handling by our own men, and believe this is due to the men thinking that the tamper is far superior to the pick and they take pride in giving it proper care.

These tampers cost money and we should make every effort to take good care of them. Manufacturers' instructions state what grade of oil to use and how much to use. This is essential in the upkeep of a tamper. To fail to do this may result in burning the piston rings. Also, it will deprive one of the services of his tamper for some time. Tampers should be checked over several times each day when in use to see that everything is in good condition, for a loose bolt may cause the tamper to get out of line and ruin some part, putting the tamper out of service.

Your committee recommends the unit tie tamper for spot-tamping in stone ballast. It also recommends that two of these tampers be provided for each stone ballast section.

Bridge Construction Feature of S.P. Relocation

(Continued from page 600)

in the best practicable condition. After erection, and immediately before being painted, all exposed metal surfaces to be painted shall be cleaned thoroughly and all damaged areas in the original paint film and the heads of all field rivets shall be painted with a priming coat of paint. After the paint on the repaired areas and rivet heads has set thoroughly, two additional coats of paint shall be applied on the exposed surfaces as herein provided, or as directed by the contracting officer. All paint, except aluminum paint for the metal handrails and for the manhole frames and covers, shall be furnished in accordance with the following formulas:

"The first field coat is to be made of dry red lead, 26.8 lbs.; lamp-black, 0.23 lb.; linseed oil and turpentine; the pigment being 75 per cent and the vehicle 25 per cent.

"The final field coat is to be a graphite coat and the pigment is to be 40 per cent and the vehicle 60 per cent."

The paint materials are furnished to the contractor and are manufactured to Bureau of Reclamation specifications.

"All painting shall be performed in a careful and workmanlike manner satisfactory to the contracting officer, and each coat of paint shall be allowed to dry properly and shall be free from dust, dirt and other foreign substances before the succeeding coat is applied."

Now note the following clause in particular.

"To secure the maximum thickness of paint film on rivet heads and on the edges of plates, angles and other rolled shapes, these parts shall be painted with an extra coat in advance of the general application of each coat. Small cracks and cavities which have not been sealed in a watertight manner by the first field coat shall be filled with red lead paste before the second field coat is applied."

You will note that previous to putting on the first field coat, the painter goes over and paints the edges of all angles, plates and lacing bars, and all rivet heads. This does not mean only field rivet heads, but all rivet heads in the bridge. Then he gives the entire structure the first field coat. He then goes over it again and paints all of the edges and rivet heads with the paint specified for the final field coat.

This specification for the painting of all of the bridges being built on the new line diversion covers the general practice of the Southern Pacific in painting new bridges.

Wood Treated in 1940 Gains 8¼ Per Cent

(Continued from page 604)

pressure processes in 1940, and all but 25,515 lin. ft. were treated with creosote or creosote mixtures.

During 1940, the wood-preserving industry used 174,625,305 gal. of creosote, as compared with 163,864,259 gal. used in 1939, an increase of 10,761,046 gal., or 6.57 per cent. It is of interest to note that the consumption of creosote in 1940 has been exceeded only once since 1930 (in 1937), and that it was only 51,748,922 gal., or 23 per cent, less than the consumption in 1929, which was the largest ever recorded.

Mixtures of creosote and petroleum in 1940 consumed 31,386,909 gal. of petroleum, compared with 24,438,774 gal. consumed in 1939, an increase of 6,948,135 gal. This volume of petroleum was used in the preparation of 64,370,186 gal. of such mixtures, as compared with 50,628,963 gal. in 1939, an increase of 13,741,223 gal.

In 1940 the wood-preserving industry used 1,220,000 lb. of zinc chloride, a reduction, as compared to the previous year, of 731,517 lb., or over 37 per cent. On the other hand, the quantity of chromated zinc chloride increased 1,390,343 lb., or 54 per cent, as compared to the quantity used in 1939.

For the fourth successive year Wolman salts (1,062,048 lb.) and zinc-meta-arsenite (201,547 lb.), have been segregated from miscellaneous preservatives and are shown separately in the report. These quantities represent a decrease of 138,568 lb. of Wolman salts and of 14,233 lb. of zinc-meta-arsenite, as compared to the quantities consumed in 1939. For the first time another preservative, Celcure, formerly included in the miscellaneous group, has been segregated and reported separately. In 1940, 242,739 lb. of Celcure were used. For the remainder of the preservatives, 401,587 lb. of miscellaneous salts and 239,358 gal. of miscellaneous liquids were used in 1940, a reduction of 26,378 lb. and an increase of 223,731 gal., respectively, as compared to 1939. The amount of miscellaneous salts would, however, have shown an increase if Celcure had not been removed from that classification.

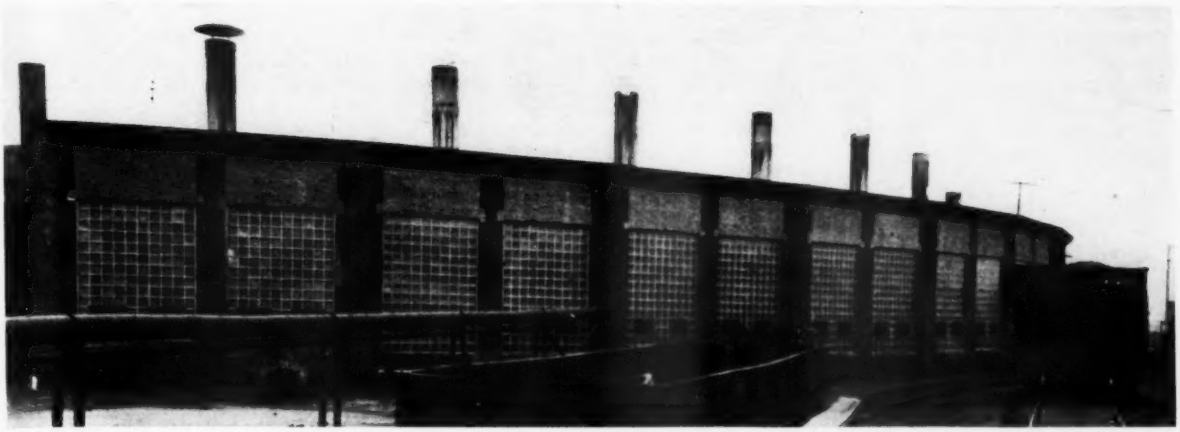
Treating Plants

The number of treating plants in the United States in 1940 was 228, one less than in 1939. Of these, 223 were in active operation, the highest number on record, two more than in 1938 and 1939, the previous record years. During the year, only 5 plants were idle. Five new plants were constructed, all of them being pressure plants, and 4 plants were abandoned, 1 pressure plant and 3 of the nonpressure type. Of the total number of plants in existence, 179 were commercial plants that treat wood for sale or by contract; 23 were owned and operated by railways, and 26 by public utilities, mining companies, etc., to supply their own needs.

Treatment of Miscellaneous Material (Ft.b.m)

	1940	1939	1938	1937
Lumber	234,133,962	186,429,495	116,640,856	118,258,910
Fence posts	17,926,013	13,819,213	14,206,465	15,985,256
Tie plugs	2,581,215	1,559,314	788,781	870,486
Crossing plank	724,506	None Reported	807,684	1,379,114
Car lumber	None Reported	48,204	None	137,544
Window sash*	416	.....	.....	.....

*For the first time in these reports, window sash are reported as a separate item under miscellaneous material.



Glass Blocks Were Inserted in the Window Openings of the Outer Circle Wall at Six Stalls of the Enginehouse

Salvaged Glass Blocks Replace Old Window Sash

Increasing attention is being given to the possibilities inherent in the use of glass blocks for filling the window openings in railway buildings. For this purpose the Pennsylvania recently acquired a large quantity of such blocks that had been released from buildings of the New York World's Fair. This article describes the manner in which the major portion of these blocks were inserted in three large buildings.

REFLECTING the increasing use of glass blocks in railroad buildings, the Pennsylvania has acquired a large quantity of second-hand glass blocks, salvaged in the dismantling of New York World's Fair buildings, for use in the replacement of conventional sash in various buildings. For a number of years this road has been using glass blocks on an increasing scale, particularly in enginehouses, this trend being based on the belief that, as compared with standard sash, glass blocks are more economical to maintain, afford a higher quality of illumination, and are easier to keep clean.

Quantity Obtained

A total of 12,677 of the blocks were obtained from the World's Fair, of which 9,432 were 12-in. by 12-in. by 3½-in. in size, while 3,245 were 8-in. by 8-in. by 3½-in. in size. Of the 12-in. blocks, 7,880 were installed in various buildings at the Meadows engine terminal near Jersey City, N. J., while the remaining 1,552 units were sent to Altoona, Pa. All of the 8-in. blocks were sent to Harrisburg, Pa. Since the largest installation of the blocks was made at the Meadows terminal, and also because they were inserted there in a diversity of buildings, a description of the work at this point will suffice to give an idea of the manner in which they were used.

At this terminal the blocks were applied in the window openings of three separate structures, all of considerable size, including the erecting shop, another shop building, known as the L-5 shop, and the outer circle wall of the enginehouse. In all three of these structures the side walls are largely of brick construction and originally all of the window openings were fitted with wood sash. Late in 1940 the erecting shop was severely damaged by fire, and in the reconstruction and repair work it was decided to replace all sash that required complete renewal with the second-hand glass blocks. Further, the sash in the L-5 shop and the enginehouse were in need of repair or renewal and it was decided also to replace many of these old sash with the glass blocks. The blocks that were used in this work are actually 11½ in. square but they are laid up with ½-in. mortar joints so that the effective dimensions of each block become 12 in. by 12 in.

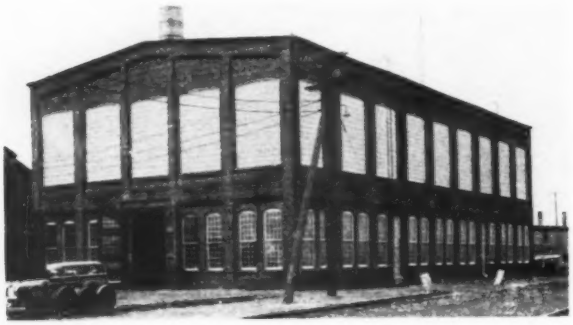
Largest Installation

The largest number of glass blocks to be placed in any of the three buildings was inserted in the window openings of the L-5 building. This structure is rectangular in plan, and is 71 ft. wide and 135 ft. long. The westerly end of this building is of frame construction and is without windows, but the other three sides are of brick and have two tiers of windows except the south side which has only the upper tier. Originally all windows in this structure, and in the erecting shop, had arched lintels.

In the window-repair operations, all of the upper tier openings of the L-5 building were filled with the glass blocks. These openings are each 10 ft. 6 in. wide and 15 ft. 6 in. high, measured to the crown of the arched lintel. There are five such openings at the east end and nine in each side. Each of these openings was fitted with an unbroken panel of 150 blocks, each panel being 10

blocks wide and 15 blocks high. Thus, a total of 3,450 glass blocks were placed in the 23 upper-tier openings in this structure.

The blocks that were installed in this building are of a type that deflect light downward and hence they were considered to be particularly advantageous for use in the upper-tier openings. The window openings in the lower tier are much smaller in size, being 4 ft. 2 in. wide and 11 ft. high, and the sash in these openings were renewed in kind, that is, with double-hung, multiple sash, glazed with single-strength glass, the frames being renewed also.



In the L-5 Shop Building, Shown Here, Glass Blocks Were Inserted in All the Upper-Tier Windows

In the Erecting Shop

The erecting shop at the Meadows terminal is of the transverse type, rectangular in plan, and originally it was 76 ft. wide and 329 ft. in length. This structure lies roughly in a north-south direction and is served by a transfer table on the east side, with tracks extending from the transfer table runway through doors in the east wall of the shop. The two end walls and the east wall of this building each had two tiers of windows, with the lower tier on the east side consisting of relatively small openings between the track doorways. In the west wall of the building, two tiers of windows had been boarded up.

At the southerly end of the erecting shop, the existing sash were repaired as necessary, but all of the old wood sash in the east wall were removed and replaced with the glass blocks. Also, in order to provide more daylight illumination in certain of the adjacent shop facilities along the west side of this building, some of the existing openings in the lower tier of the west wall were fitted with glass blocks. The remaining openings in this wall were closed with building brick.

In the east wall of the erecting shop, the upper tier of windows is comprised of 10 large openings, each 10 ft. 6 in. wide and 15 ft. 6 in. high, alternating with much smaller openings. These smaller openings were closed with building brick, but the larger windows were each filled with an unbroken panel of glass blocks measuring 10 blocks across and 15 blocks in height. The lower tier of windows in this wall embodies 9 openings, each of which was filled with a panel of 50 blocks, measuring 5 blocks wide and 10 high. In addition, three of the track doorways at the southerly end of this wall were walled up with building brick, except for a small opening in each doorway, which was fitted with a glass-block panel of the same size as those in the other lower-tier openings.

In the westerly wall of the erecting shop, five of the openings were filled with the blocks, each of which required a panel measuring 7 blocks wide and 10 high. Two of these panels are located where there is a welding shop on the other side of the wall. On the opposite side of the welding shop, it is separated from an adjacent machine shop by a brick partition containing two window openings which had previously been unfilled. To minimize the fire hazard, while at the same time not interfering with the transmission of daylight illumination to the welding shop, both of these openings were filled with glass blocks. These panels are likewise 7 blocks wide and 10 high. Altogether, 2,490 glass blocks were inserted in the various openings of the erecting shop.

In the enginehouse, the window openings in the outer circle wall at six adjoining stalls were filled with the glass blocks. At each stall there are two openings, each of which originally contained two windows separated by a wood post. In the repair work these posts were removed, along with the frames and sash, and each of the openings was filled with a single panel of glass blocks, 10 units wide and 14 high. Thus, there are two glass-block panels at each stall, or 12 in all, containing a total of 1,636 blocks. For ventilation, each of these panels contains two movable windows with steel sash and frames, which are glazed with wire glass. Each of these windows is 2 ft. high and 3 ft. long.

Only glass blocks that were in perfect condition were used in this work. To prepare them for installation, all the old mortar was first chipped off, after which the sanded bonding surfaces were renewed by painting them with white lead and then dipping each of the freshly-painted surfaces in a box of clean graded sand. After the blocks had been laid up, they were cleaned with muriatic acid applied with steel wool.

Preparatory to placing the glass blocks in the L-5 building and the erecting shop, the arched lintels were filled in with building brick so that the upper sides of the window openings would have straight lines. Also, it was necessary in most cases to make width adjustments of the openings in order to adapt them to the closest approximation of the original sizes that could be obtained with the 12-in. blocks. Where this was necessary it was done by reducing the width of the openings the required amount with building brick. This procedure was necessary in all openings in the L-5 building and in the upper tier of windows in the erecting shop. However, in the lower tier of windows in the latter building, the width of the openings was such that there was a clearance of ½ in. on both sides of each panel.

Reinforcement

In all cases the glass-block panels were laid up with a continuous tie in each horizontal joint, consisting of a perforated strip of galvanized metal 2 in. wide. Additional provision was also made for protecting the panels against lateral pressure. In the L-5 shop and the erection shop, a small structural angle is placed vertically along each side of the inside face of each panel, one leg of the angle being fastened to the brickwork. On the exteriors of the windows in these two buildings, the brickwork along the vertical sides of most of the openings is rabbetted to receive the edges of the glass-block panels, thereby providing resistance against pressure from the inside. In the enginehouse the vertical edges of each panel extend between the outstanding legs of 5-in. channels fastened to the sides of the window opening. All the glass-block panels were constructed with small clearance openings along the vertical sides, which were filled with fiber glass to serve as a cushion and then closed by caulking.

(Continued on page 612)

Illinois Central Solves Emergency Created by Drouth

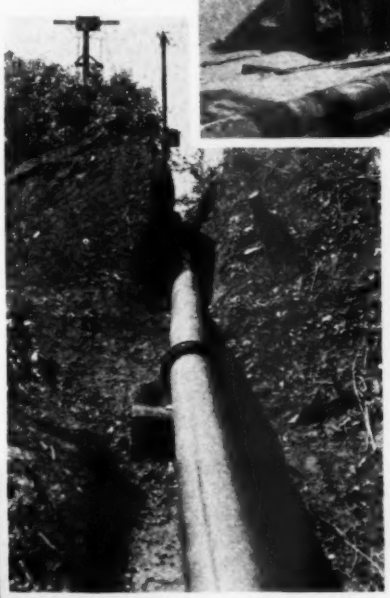
Failure of the municipal water supply at Carbondale, Ill., from which the road obtained the water required at its important terminal at this point, created an emergency that had to be met quickly. This article describes the manner in which pumps, pipe and electrical equipment were assembled and a new pumping station was improvised in six days' time

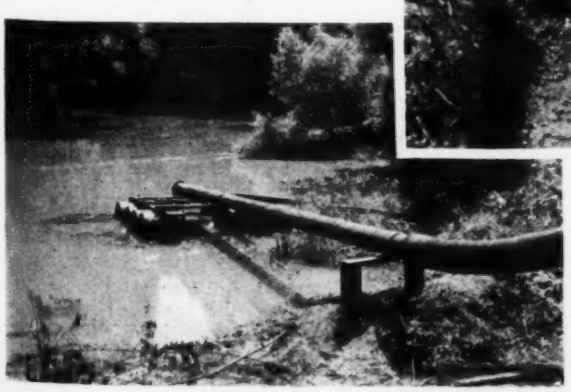
FACED with an emergency of the first magnitude through failure of the city water supply at Carbondale, Ill., an important terminal on the Illinois Central, from which it drew its requirements, the water service department of this road completed a pumping station of large capacity, including the laying of 1½ miles of 10 and 12-in. pipe line, within 10 days after the authority to proceed with the work was issued and within six days after the first material arrived on the ground. This accomplishment is all the more noteworthy because of the difficulty encountered in obtaining material, as well as because of the capacity of the plant, and the further fact that it was installed in such manner that it can be continued in operation indefinitely.

Drouth conditions have prevailed in southern Illinois for more than a year and have become acute in recent weeks owing to the hot dry weather that has continued over this area since early spring. As a result, water reserves have dwindled and many communities in this area, extending from the central part of the state to its southern boundary, although long under severe restrictions with respect to water consumption, are now faced with serious water shortages or complete failure of their supplies, as streams have dried up and reservoirs have fallen well below the danger point.

Owing to rainfall well above normal in 1937, both municipal and railway reservoirs were filled and flowing over spillways at the end of that year. Since then, however, rainfall over this area, especially in the southern part, has been deficient—it was only 25-in., or less than two-thirds of normal, in 1940, and so far this year the deficiency has been relatively greater, since precipitation to August 1 has beeen only 12 in., compared with a normal of 25 in.—and the subsurface water table has been lowering gradually, until at present wells have dried up and the flow in streams has decreased to record lows or ceased.

Right—The Emergency Pump House Was Built of Second-Hand Lumber, As Adequate to the Temporary Needs





Left—The Suction Line Was Supported On a Float of Chemical Drums. Above—Up the Steep Bank of the Big Muddy River

Water Supply Depleted

Carbondale is an important terminal on the main line of the Illinois Central between Chicago and New Orleans. It is the junction point with the line to St. Louis, Mo., and is the center from which lines radiate to Thebes, Ill., to Metropolis, and into a network of branches extending throughout the Williamson and Franklin county coal-mining districts.

It is also the concentration point for much of the coal that comes from these districts.

Carbondale and the area immediately surrounding it have suffered more than most of the communities in this section of the state, with respect to deficient rainfall and depletion of their water supplies. The city depends for its water on a municipal reservoir having a capacity of 400,000,000 gal. Its normal domestic consumption averages 450,000 gal. a day, in addition to which it supplies 500,000 gal. a day to the Illinois Central and from 50,000 to 100,000 gal. daily to the tie-treating plant operated by the Wood Preserving division of the Koppers Company, a total normal consumption of more than 1,000,000 gal. daily. When full, the reservoir, therefore, contains a sufficient supply for 13 months normal consumption.

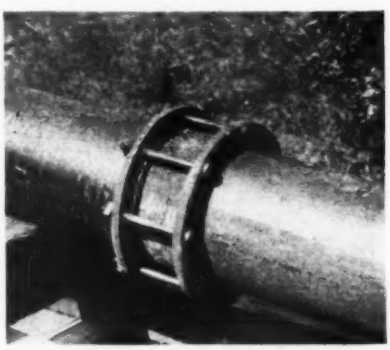
The City's 400,000,000-Gal. Reservoir Contained only about 4,000,000 Gal. on June 14

As the drouth continued, the inflow from the watershed serving the reservoir was reduced sharply and for the last few months has been insufficient to offset evaporation. It became evident by May that, even with severe restrictions on consumption, the supply would last only a short time, and arrangements were made to obtain water from Thompsons lake, a private reservoir containing about 50,000,000 gal. At the time the change to this lake was made, on June 14, the municipal reservoir contained only about 4,000,000 gal. and this has since been reduced noticeably by evaporation.

Kept in Touch

The water service department of the railway kept in close touch with the situation and decided that the only way to safeguard its requirements for water would be to install an emergency pumping station at the Big Muddy river, 4½ miles north of Carbondale. Authority to do this was obtained on July 1, and immediate steps were taken to assemble the necessary material and equipment, and the plant was placed in operation on July 10, only six days after the first material arrived on the ground.

The railway had maintained a pumping station at the Big Muddy from the beginning of operation until about 1920. A 12-in. pipe line from this plant to the service tanks at Carbondale was completed in 1918 to replace an 8-in. line laid in 1906. When the city installed its reservoir, however, the railway abandoned its pumping station and began taking water from the city, primarily because it was of much better quality than the water from the river. As the name of the stream implies, the water carries a high content of suspended matter. During the periods of normal flow the dissolved solids are also high, a considerable part of which come from mine drainage.



New Bolts and Gaskets Were Used With the Second-Hand Dresser Couplings

Since the pumping plant was abandoned about 20 years ago, several sections of the 12-in. line, four in all, aggregating 8,100 ft., had been recovered for use elsewhere. It was necessary, therefore, to replace this pipe before water could be pumped from the river to the service tanks, two of which were located at the north yard, where the coal from the mining district is assembled. The third tank, a mile further south at the passenger station, was discontinued during the emergency to prevent contamination of the city supply.

In expectation that authority for the emergency station would be granted, efforts to obtain the necessary pipe were made on June 20, but it became evident almost immediately that it would be impossible, under the restrictions imposed by national defense activities, to obtain new pipe in time to meet the impending emergency. An immediate search was, therefore instituted to determine whether second hand pipe was available in the necessary sizes. Fortunately, 7,100 ft. of second-hand 10-in. steel pipe was located at Evansville, Ind., and 1,300 ft. of similar 12-in. pipe was found at St. Louis, Mo. Both of these lots were obtained from public service companies, and had been released only a few weeks earlier. Both lots were clean and smooth and showed no signs of corrosion, and both were accompanied by sufficient Dresser couplings to complete their assembly.

A second-hand centrifugal pump was found, which had been released from service and reconditioned only recently, and this was sent to Carbondale. This pump had an 8½-in. impeller, and at 1,800 r.p.m., was rated at 750 g.p.m. at a head of 90 ft. However, it was necessary for it to operate under a head of 135 ft., and to do this the impeller diameter was increased to 12½ in. This increased the periphal speed, but cut the delivery to 600 g.p.m.

Likewise, a motor was released from other service to meet the emergency and a starter, a fuse box and other electrical equipment necessary to make the installation possible, were removed temporarily from less important service. Valves and other fittings were obtained from a stock of second-hand material that had been reclaimed and repaired by the water-service department.

Pipe Laid Quickly

On Friday morning, July 4, the 12-in. pipe from St. Louis arrived in Carbondale, and the work of unloading began at once. The 10-in. pipe from Evansville arrived on July 8 and was also unloaded at once. All of the pipe, which was in 40-ft. lengths, was loaded on flat cars and was unloaded by means of a crawler-mounted dragline fitted with a long boom and working from the flat cars. Working on the ground, a smaller dragline handled and placed the pipe for the forces engaged in assembling it.

All of the 12-in. pipe was laid underground, in a trench having a maximum depth of 6 ft. The 10-in pipe was laid on top of the ground, except when necessary to connect it with the original 12-in. line, and for a short distance at the crest of the steep bank of the river. New bolts and new gaskets were used with the Dresser couplings that came with the pipe. The

pipe-laying gang consisted of 12 men, 2 of whom cleared the ground and distributed the couplings; 6 men placed the pipe with the aid of the dragline and leveled and blocked it ready for the couplings; and 4 men fitted the couplings. Working in this manner, one mile of the 10-in. pipe was laid in a day, and the remainder in less than a half day. The laying of the 12-in. pipe was somewhat slower, owing to the trenching that was necessary, but this was completed before the 10-in. pipe arrived.

In the meantime work was progressing on the installation of the pump, the suction line and the electrical equipment. The new impeller was received on July 3, and the changes in the pump were made on the ground after it came. A whole-line water service gang of 6 men placed the foundation for the pumps and a division carpenter gang constructed the temporary pump house with second-hand material. The suction line consists of 20 ft. of 8-in., 6-ply, flexible suction hose, connected to the pump and extended to the river with an 8-in. steel pipe. To care for fluctuations in the level of the river, the suction end of the pipe is supported on a float made of eight empty chemical drums tied together with timbers. To prevent drainage of the pipe line and the necessity for priming the pump, the suction line is equipped with a foot valve.

Complete co-operation was obtained from the electrical department of the railway, which provided the necessary materials and equipment for electrical operation. This department also arranged with the power company to extend its 2,300-volt power line to the right-of-way and to install transformers outside the pump house to step the current down to 440 volts. This department then connected an extension to the transformers and installed the power line to the pump.

The new plant was placed in operation on July 10, only six days after the first load of pipe arrived, and has been in continuous operation since that date. As installed, there was only one pump, which was controlled manually. Shortly after the plant began operation, a second pump, having a capacity of 340 g.p.m., was placed as a standby unit. Also, since the second pump was placed in operation, material has been obtained and installed to make the operation of these pumps entirely automatic, except that the change in pumps must be made manually.

Prior to the time when the Illinois Central ceased taking water from the city, the tie plant had been cut off. Relief from these two loads and the restrictions which the city has imposed on domestic consumption have cut its pumpage materially, although on August 1, only a 30-day supply remained in Thompsons Lake. As water is essential for the operation of the tie plant, the railway is now supplying its requirements, which for the moment amount to only about 56,000 g.p.d.

New Supply Dependable

During the almost 90 years since the Illinois Central began operation in southern Illinois, the Big Muddy river has never gone dry, although the flow has been quite restricted at times, so that there is every prospect of a dependable supply of water unless conditions become worse than during any period of record. Peculiarly enough, however, despite the severe and widespread drouth throughout this area, there have been intermittent heavy local rains, several times reaching almost cloudburst proportions, over the drainage area near the headwaters of this stream, and the water level has fluctuated as much as six feet since work on the emergency station was started on July 4.

Normally, at this time of year and continuing until the winter rains occur, the dissolved solids reach a total hardness of about 15 gr. to the gal., of which approximately 10 gr. are sulphates, generally resulting from mine drainage. An analysis of the water on July 19 showed a total hardness of only 7 gr., of which 4.8 gr. was sulphate hardness. One week later, on July 26, the total hardness had changed very little, being 6.8 gr., but the sulphate content had been reduced to 3.3 gr., this favorable condition resulting in large part from the rains that occurred upstream.

As a matter of interest, Carbondale has now obtained permission from the federal government to pump water from Crab Orchard lake, a recently constructed impounded supply about three miles to the east. The city is now engaged in laying a pipe line to the reservoir and will soon have ample water for all of its needs. The railway will find it necessary, however, to maintain and operate its emergency station until the drouth is broken and the city reservoir is again filled.

Fissured Rail Derails Fast Passenger Train

THE derailment of the South Wind, a first-class passenger train in Chicago-Florida service, on the Atlantic Coast Line, near Dupont, Ga. on the morning of April 10, resulting in the injury of 67 passengers, 9 dining car employees and 1 train service employee, was, according to the report on this accident issued by the Interstate Commerce Commission, due to a broken rail at a large transverse fissure. Whether this fissure could have been detected by trackwalkers is problematical, but the Commission took note of the fact that a transverse fissure detector car had never been operated in the territory involved, and that inspection of the track was confined to observations which were made from a motor car at intervals of about once a week.

The accident occurred in tangent, single-track territory, having a maximum authorized speed limit for the train involved of 62 m.p.h. At the time of the derailment, the train was traveling eastward, and, according to testimony, was moving at a speed of about 60 m.p.h.

In the vicinity of the point of accident, the track structure consists of 100-lb. rail, 39 ft. long, laid on 23 or 24 ties to the rail length. It is fully tie-plated; single spiked; equipped with four-hole continuous angle bars and two to four anchors to each rail; and is ballasted with six inches of slag on top of seven inches of gravel. The rail involved was rolled in January, 1927, and was laid during the same year.

According to the evidence, after the accident occurred, a rail on the north side of the track was found broken into eight pieces. The derailment occurred at the first fracture, which was at a point 26.4 ft. east of the receiving end of the rail, while the six additional breaks occurred at points 32.1 ft., 33.45 ft., 35.05 ft., 36.3 ft., 37.15 ft., and 37.95 ft., respectively, from the receiving end.

Examination of the first fracture disclosed a transverse fissure covering approximately 75 per cent of the head area. All except a small area at the top of the head and ⅛ in. at the lower part of the base had been broken a considerable time prior to the occurrence of the accident. The third,

fourth, fifth, sixth and seventh fractures showed transverse fissures of 4, 8, 18, 7 and 12 per cent of the head area, respectively.

Because of batter marks on the adjacent ends of the first and second pieces of the broken rail, it appears apparent, according to the report, that the wheels of some westbound train passed over this point after the rail had become entirely broken. When the last westbound train and the last eastbound train passed the point involved, about 8 hr. and 3½ hr., respectively, before the derailment occurred, no abnormal condtion was observed. The track was last inspected five days prior to the accident, this inspection having been made from a motor car moving at a speed of 18 to 20 m.p.h. A transverse fissure detector car had never been operated over this line.

The investigation disclosed further that inspection of the track involved usually consisted of observations made from a motor car about once each week. Taking special note of this fact, the Commission stated that since the greater part of the fracture apparently had progressed to the surface of the rail a considerable length of time prior to the occurrence of the accident, it is probable that the defective condition would have been discovered in time to have averted the accident if frequent and thorough inspection had been made. To safeguard operations on lines where trains are operated at a high rate of speed, it continued, it is highly important that the track structure be given close inspection.

Boards on Rail Cause Train Derailment

A NORTHBOUND first-class passenger train on the Norristown branch of the Reading was derailed at Manayunk, Pa., at 6 p.m., on April 26, resulting in the death of the engineman and injury of the fireman and 89 passengers. This accident, according to a report issued by the Interstate Commerce Commission, was caused by boards being on the high rail of a curve.

At the locality of the accident, a double track line of the Reading passes under a double track line of the Pennsylvania 662 ft. north of the Reading station at Manayunk at an angle of 59 deg. with and at an elevation 24 ft. below the Pennsylvania tracks. The Pennsylvania station, consisting of a waiting room and platform, is located 142 ft. north of the crossing, parallel to the Pennsylvania tracks, and 25 ft. distant horizontally from the northbound track of the Reading. Immediately behind the Pennsylvania station are a retaining wall and picket fence parallel to and overlooking the Reading tracks.

The derailment occurred at a point 805 ft. north of the Reading station opposite the Pennsylvania station on a 3 deg. curve to the right. The train involved consisted of an engine of the 4-6-0 type, two coaches, one combination car and one baggage car in the order named. It became derailed while moving at a speed estimated as 40 to 45 miles per hour. Investigation following the accident revealed that the track was in good condition and no condition on the engine prior to the derailment was found that could have contributed to or have been a cause of the accident.

Boards on High Rail

Several pieces of board were found near the point of derailment and one board directly at the point of derailment was crushed into two portions. At this point there were splinters of wood mashed flat on the head of the high rail, and directly north of the crushed board a flange mark appeared on the head of the rail, extending a distance of 24 ft., then dropping to the outside of the rail, following which, derailment marks appeared on an angle bar and on the ties to the crossover switch, where the general derailment occurred.

During the morning previous to the accident repairs had been made to the Pennsylvania station at Manayunk. A new window and new flooring were installed and portions of the water table were removed. Just prior to the occurrence of the accident, seven boys whose ages ranged from 9 to 14 were gathering discarded boards from the Pennsylvania station for firewood. Five boys threw the boards over the retaining wall to the Reading tracks below, where two boys were loading them on a bicycle to haul away.

The boards found on the Reading track were identified as material released in the repair of the Pennsylvania station and water table. The carpenter who assisted in the repair work testified that the work was completed about noon and that none of the refuse lumber fell to the Reading tracks during the time the repairs were being made. He said that all discarded lumber was given to nearby residents for firewood. He understood that it was contrary to instructions to leave loose material lying near the scene of repair work. He also identified the boards recovered from the Reading tracks as material discarded from the Pennsylvania station.

The master carpenter on the Pennsylvania stated that the division engineer had issued instructions not to leave material lying around the scene of any repair work.

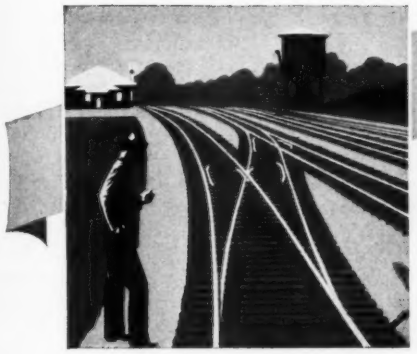
The Commission concluded that the accident was caused by boards being on the high rail of a curve.

Salvaged Glass Blocks Replace Old Window Sash

(Continued from page 608)

In the enginehouse, the original construction included a timber louver extending from the top of each window opening to the eaves. When placing the glass block panels the louvers were removed and the spaces filled in with building brick. To serve as a lintel beam for supporting this brickwork, two 4-in. by 6-in. angles, placed back to back with a 5-in. opening between them, were inserted across the top of each window opening. The lower courses of the brickwork are supported on the outstanding horizontal legs of these angles, while the open space between serves as a chase for receiving the upper edge of the glass-block panel.

Blocks having several different patterns were used in this work. In many of the blocks, the pattern is provided by straight corrugations which are present in both the exterior and interior surfaces of some of the blocks, while in others only the interior surfaces are corrugated, the exterior surfaces being smooth. Blocks embodying these patterns were used throughout the L-5 shop and in one stall of the enginehouse. Another pattern consists of curved corrugations on the interior surfaces only of the blocks, giving a ripple effect. Blocks having this pattern were employed in the erection shop and in five stalls of the enginehouse.



WHAT'S the Answer?

Good Workmanship in Laying Rail

What details are most important when laying rail, to insure best results? How should they be supervised?

Prepare in Advance

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

One of the most important requirements for best results when laying rail is that the track should be in good line, surface and gage, with all ties up snugly against the rail base, before starting to change the rail. In other words, the track should be ready to receive the rail. In general, new rail should be laid in high-speed or dense traffic territory, where the track should always be ready to receive it, and the released rail should be laid on lower-speed or lighter-traffic lines, which should likewise be prepared to receive it. Ordinarily, the regular track force under regular supervision can do the advance work where rail is to be laid.

Even where the track is in good line, surface and gage, the bearing on the ties must be prepared for the new rail. The only way to do this quickly and accurately is with power adzing machines. This item is so important that it should be done by selected men under special supervision. Extra precautions to remove just enough and not too much of the tie surface, and to insure that all adzed surfaces are in the same plane, pay big dividends.

Following these preparations, the actual putting down of the rail is largely a matter of organization. However, some details are worthy of special mention. The rail should be set in as closely as possible to the place where it is to be spiked down. The joints should be made tight, with the correct allowance for expansion, and the tie plates should be placed accurately before any spiking is done. All spikes must be driven vertically. This is so important that boring machines and creosote-injecting appliances ahead of the spikers can be justified.

If rail is laid where the track has been prepared to receive it and the work is done with care, there is no reason why the track cannot be opened for scheduled speed for the first train after final closure is made.

Refinements Demanded

By C. E. Miller
Assistant Engineer Maintenance, Chicago & North Western, Chicago

Present-day speeds and wheel loads demand greater refinements in track laying and surfacing than were deemed necessary only a few years ago, for slight irregularities that were scarcely noticeable at speeds of 60 miles an hour, are quite unsatisfactory at 90 to 100 miles an hour, that is, at speeds that are not uncommon at present. It is necessary, therefore, that the details of laying rail be watched carefully to insure the desired results and to protect the new rail from damage while it is being unloaded and laid, as well as against damage incident to permitting high-speed traffic over it before it is seated properly and surfaced. Rail is the most expensive part of the track structure, and it must not be bent permanently or kinked through overzealousness to remove speed restrictions.

Probably one of the most important details of good workmanship in laying rail is the accuracy with which the ties

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

To Be Answered in November

1. *Are lag screws or cut spikes more effective as independent fastenings for tie plates? Why? Are there other considerations?*
2. *Do metal plates make satisfactory trucking surfaces for freight-house floors? If not, why? If so, how should they be applied? How thick should they be?*
3. *What considerations should be given weight when deciding on rail renewal? What is the importance of each?*
4. *Can the use of cant hooks and dogs be eliminated in handling heavy creosoted timbers? If not, why? If so, what alternate methods and tools should be employed?*
5. *What disposition should be made of ties that are found to be sound after they are removed from the track?*
6. *What are the relative advantages of wrought-iron or steel pipe with screwed couplings, bell-and-spigot pipe and flanged cast-iron pipe for suction lines? Why?*
7. *Should section men allow for trains exceeding speed restrictions when placing slow orders, or should they specify the maximum speed thought safe and report any failure on the part of trainmen to observe the restrictions set?*
8. *What considerations should be given weight when selecting paints for building interiors? What is the importance of each? Does the use to which the building is put make any difference?*

are adzed. With modern tie-adzing equipment there is no excuse for not obtaining this accuracy. Care should be exercised to insure that the adzing is done so that the tie plates on a tie are in the same plane, that all ties are in this plane and that the adzers are adjusted for the difference in height between the old and new rails. Without this adjustment, the tie plates will be seated in different planes and the rail will not be in gage.

Gage must be watched carefully, about four sets of gagers being required, and the spikes must be driven to hold the gage. In this connection, it is good practice to check the gages at intervals to insure their accuracy.

Uniformity of bolt tension is of real importance, since for best results the joint assembly must be supported in all of its parts, yet allow expansion and contraction with temperature changes. It will be necessary to retighten the bolts after the new rail has been in service a sufficient time for the mill scale to come off and the joint bars to become fully seated.

Spiking should also be given careful attention to see that the spikes are driven vertically and bear against the plates, so that they will hold the gage and line. Too frequently, slovenly spiking is done, the spike being driven under the rail and then bent inward toward the rail base.

Correct expansion allowance is of vital importance, and the expansion shim corresponding to the rail temperature must be used. These shims should remain in place until the anti-creepers have been applied, and the latter must be set so that they have full bearing against the ties, so that the expansion allowance may not be lost when the shims are removed.

Turnouts and special trackwork require special care and should be supervised only by an experienced foreman who is thoroughly conversant with the standards governing these classes of trackwork. All dimensions must be adhered to strictly, including gage, location of guard rails, throw of switch points, adjustment and free-working of switch rods, installation of filler blocks and foot blocking, as well as similar attention to the many other details of such installations.

There are many other details connected with laying rail, all of which must be watched constantly, such as striking the rail with a maul or other heavy tool, which may cause permanent defects, carelessness in unloading, the correct stagger of the joints, the driving of the tie plugs, the adjustment of the tie plates and the possible overdriving or underdriving of spikes and anti-creepers.

While surfacing was not included in the question, it is a corollary to good workmanship in laying rail, and should follow the actual laying closely. It should be carried out with refinement so that the rail will be protected from damage and the riding qualities of the track will be maintained.

Names Four Items

By W. Woolsey

Section Foreman, Illinois Central, Chicago

Four items stand out prominently as the most important details when laying rail, namely, bolting, expansion allowance, spiking and gaging and, last but not least, immediate surfacing. No one will dispute the importance of the first three of these items, but observation indicates that the last one is not always taken as seriously as it should be, that is, sometimes, enough emphasis is not placed on *immediate*.

Supervision of the first three items, which are an integral part of the rail-laying operation, should be supervised by experienced foremen. A foreman who is not experienced in laying rail, no matter how competent a trackman he may be in other respects, is likely to overlook some of these details, for the laying of the rail moves swiftly where gangs are mechanized.

It is difficult to say which, if any, item is more important than the others, but certainly an assistant foreman should be assigned to supervise the application of the joints and the tightening of the bolts. He should also check the expansion allowance frequently. He should know that the joint bars fit properly and that they are always struck on the base when they are heeled in. It is of equal importance that spikes be driven vertically and snugly against the rail base and that the rail be gaged exactly.

Rail that is laid properly and surfaced at once will ride smoothly, wear evenly and give several more years service, than if the work is done carelessly. From this point of view, adequate supervision pays the highest dividends of any item in the cost of laying the rail.

Renewing Asphalt Shingles

When renewing asphalt or composition shingles, should the old shingles be removed, or should the new shingles be laid over the old? Why?

Leave Them On

By D. A. Ruhl

Engineer of Buildings, Chicago, Rock Island & Pacific, Chicago

Under ordinary conditions the old asphalt or composition shingles need not be removed in preparation for the application of new roofing of the same material; in fact, there are some advantages in leaving the old roof on. If this is done, there are measureable additional insulation and some protection against possible leaks in the new roof. However, valleys will require considerable attention, for new valleys should be built up; new shingles should not be applied over old valleys, as is done sometimes.

Often, considerable inconvenience, dirt and expense are involved in removing an old roof, all of which can be avoided by the application of the new roofing directly over the old. It rarely happens that the weight of two or even three layers of this roofing is enough to overburden the supporting roof structure.

If the old roof is to be removed, one must consider the cost of removal and of preparing the roof boards to receive the roofing, by driving down or pulling the old nails. Upon removal of the old roofing, it is not uncommon to find roof boards that need renewal, but which might have remained serviceable for the life of the new roofing, if they had not been disturbed.

Generally, it is not advisable to remove a portion of an old roof, as this will cause an uneven appearance in the new roof. Furthermore, any condition that will cause the removal of a portion of the old roof, will probably require the removal of the entire roof. In most cases, if the roof deck has deteriorated enough to require renewal at any point, it will be advisable to remove all of the roofing to permit inspection and renewal of such sheathing as requires replacement and the renailing of the remainder. Generally, however, it is preferable not to remove the old asphalt shingles before new ones are applied.

Take Them Off

By L. G. Byrd

Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

When conditions warrant the renewal of asphalt or composition shingles, it is usually necessary to make some repairs to the sheathing. This

is particularly true if the old roofing has been in service for a long time, for leaks usually develop in old roofing of this type and cause decay in the sheathing. If new shingles are applied over decayed sheathing, it will be only a short time before further trouble of this sort will occur in the new roof. Furthermore, it requires longer nails to anchor the new roofing to the sheathing if they must be driven through two layers of roofing.

We have applied asphalt, composition and asbestos shingles over old shingles and over prepared roofing. Invariably, at a later date, however, it has developed that the service of the new roofing was not satisfactory. Again, the increased weight has required the strengthening of the supporting roof numbers in some designs of roof. Our experience has indicated that more satisfactory results are obtained if the old roofing is removed and the sheathing is repaired before the new application is made. This method insures a much neater appearance for the new roof, as well as longer service.

On some of our lines we experience high winds and where this occurs we find that where the new shingles are applied over the old ones, they are more easily torn off, since the wind almost invariably finds some way of getting between the two layers and lifts the top one enough to tear portions of it away. Very few shingles lie flat when they are applied over old roofing. On the other hand, experienced contractors sometimes recommend this method of application over both asphalt and wood shingles.

Serve No Useful Purpose

By G. S. Crites
Division Engineer, Baltimore & Ohio, Punxsutawney, Pa.

Old shingles should be torn off, the only useful purpose they could possibly serve would be that of insulation and their value in this respect is debatable. The life of a shingle roof depends in large measure on the smoothness and the lasting qualities of the sheathing, its fastenings and the fastenings used to secure the shingles. The only sure way to determine the real condition of the sheathing and its fastenings is to remove the old roofing and expose the sheathing to inspection. It is not wise to take chances in this respect. In many cases, sheathing may appear to be secure and in good condition when inspected from below, when as a matter of fact it is not. It is poor economy to tack down shingles on an uneven surface and a poor bearing. Leaks are almost certain to develop shortly, and the wind may dislodge the exposed roofing.

Roofs are important, for they are intended to protect the building and its contents against the elements. A poor roof may not only cause damage to the contents but it may cause rapid deterioration of the structure itself. An improperly applied roof covering may cost in losses many times the amount necessary to have put it on properly in the first place.

Water Treatment and Pipe Lines

What effect does the treatment of water have on pipe lines, valves and water columns? How can the trouble be overcome?

Depends on Treatment

By R. C. Bardwell
Superintendent Water Supply, Chesapeake & Ohio, Richmond, Va.

The effect of the treatment of water, so far as it involves pipe lines, valves and water columns, depends on the type of treatment given the water and the facilities and care with which it is handled. Treatment with chlorine and with chlorine and ammonia for bacteriological disinfection, should have no appreciable effect on the water lines and appurtenances. Zeolite treatment, which removes all of the scale-forming matter, will reduce incrustation troubles, but may result in some pitting and the formation of rust barnacles as a result of the action on the bare metal of the dissolved oxygen in the water. The remedy in this case is suitable pipe coatings.

Improper treatment with lime and soda ash or partial treatment with soda ash alone, such as is practiced at many wayside stations, will result in a water that is either saturated or supersaturated with calcium carbonate (limestone). Such a water will cause heavy and troublesome incrustation in pipe lines, valves and the exposed operating parts of water columns, particularly the valve parts and the valve chamber. The remedy for trouble of this sort at lime-soda ash plants lies in proper treatment of the water. Suitable coagulation, such as is afforded with sodium aluminate, thorough mixing of the treating chemicals, in correct proportions, with the water, and a retention period of sufficient length to insure completion of the chemical reactions, together with an adequate sedimentation period, will result in a treated water of low hardness, which will not cause appreciable trouble from after-precipitation.

When facilities for proper treatment are not available, or when the trouble results from partial treatment with soda ash at wayside plants, it is usually advisable to use a supplemental treatment with one of the available polyphosphates, such as sodium hexametaphosphate, which will check after-precipitation deposits when used in amounts as small as 1 lb. to 60,000 gal. of water. Similar results are reported from the use of some of the tannin compound mixtures which have been placed on the market by several commercial concerns which are handling water treatment on a large scale.

Old Scale Will "Seed"

By E. M. Grime
Engineer of Water Service, Northern Pacific, St. Paul, Minn.

When water is treated by the so-called lime-soda ash process, there is usually a hardness of one to two grains remaining in the treated water as it enters the pipe line and other facilities. In other words, the treated water is super-saturated with calcium carbonate. This carbonate is in an unstable condition and likely to precipate and form scale whenever a change in the condition of the water takes place by reason of variations in temperature, pressure or treatment. Also, when there is already a coating of scale in the pipe line, there is a "seeding" effect, which creates a tendency for the calcium carbonate in the water to attach itself to the old scale.

Where water used for drinking purposes is being softened by the lime or lime-soda ash process and there is no particular objection to a certain amount of hardness, the calcium carbonate remaining in the treated water is changed over to calcium bicarbonate by recarbonation or the forcing of CO_2 into the water. It is then in a stable form where it will not cause pipe-line incrustation.

Hardness is objectionable in water supplied to locomotives, and to avoid incrustation in water-supply lines, the use of organic materials is now becoming common practice. Through the use of a small amount of these

chemicals, precipitation of the calcium carbonate can be retarded until the water has passed through the pipe line and has entered the boiler.

Acid Will Clean

By Earl C. Johnston
Water Service Foreman, Baltimore & Ohio, Punxsutawney, Pa.

Cold water that has been treated seldom causes pitting in pipe lines, valves or other fittings. On the other hand, pipe lines that carry hot water after treatment, valves and other fittings, may be subject to severe pitting. So far as I know, there is no remedy for this action, and the only thing that can be done is to make replacements when these lines and fittings lose their serviceability.

Softening of the water is accomplished by chemical reactions that cause precipitation of dissolved solids and the coagulation and settlement of solids in suspenison. The precipitates must be allowed to settle, but not all of them will settle out within a reasonable time. Therefore, the unsettled solids, usually calcium carbonate, will be carried along the pipe lines and part of them will be deposited, causing liming or incrustation of the pipes, valves, and the valve chamber of water columns. The addition of tannin in the correct amount will tend to prevent after-precipitation, and will form a soft sludge out of most precipitates and will thus prevent excessive incrustation. Heated settling basins hasten the settlement of precipitates. For some treated waters, heated settling basins are justified.

Hydrochloric acid introduced directly into the pipe lines and caused to surge through them, will clear them of incrustation. If they are badly incrusted before this is done, a bulldozer or go-devil, as it is known variously, can be put in along with the acid, and as the latter flows back and forth, the bulldozer will keep the surface of the lime incrustation exposed to the acid. Where pipe lines, valves of water columns are incrusted badly, it may be necessary to take them apart to clean them, but pipe lines should never be allowed to get in this condition. The careful use of the acid will prevent it.

Disposal of Old Ties

Is it practicable to dispose of old ties to residents along the line? If not, why? If so, under what conditions? Are there objections to the practice?

Try To Be Neighborly

By C. R. Schoenfield
Roadmaster, Chicago, Burlington & Quincy, Aurora, Ill.

It has always been our practice to be neighborly with residents adjacent to our line, and I have found that it is much better to give the old ties to some one who can make use of them than it is to burn them. There is quite a saving if the old ties can be picked up by persons who want them, as it eliminates the time involved in piling them for burning. I have received a number of favors that were beneficial to the railway, from persons to whom I have given old ties that had no remaining value to the railway. I am sure that it is a mistake to burn old ties, or any old lumber, that can be used by our neighbors.

I always inspect the ties personally and release them before they can be given away. I also have a definite understanding with the persons to whom they are given that they must not throw the ties over the fence and pile them on their property and leave them there; they must be taken away at once. Occasionally, some incident occurs that leads our officers to believe that it is a mistake to give the old ties away. Again, there are some situations where it is difficult to get at the ties or it is hazardous to haul them away. Obviously, all of these things should be considered when the ties are given away. However, through an experience extending over 34 years, I have come to the conclusion that it is worth while to know that the folks along the line have a friendly feeling toward the railway. I have also discovered that this attitude depends in large measure on the section foreman, roadmaster and other division officers.

Creates Good Will

By C. D. Turley
Chief Tie Inspector, Illinois Central, Chicago

Our experience has been that there are both advantages and disadvantages in giving away or otherwise disposing of old ties to residents along the line. Among the advantages are: (a) it saves the railway the expense of piling and burning them; (b) the extra expense of loading and hauling them away is avoided in those circumstances where they cannot be burned at the point where they were removed from the track; (c) fires on the right-of-way are always a hazard to other railway property—bridges, buildings, wire lines, etc.—and at times may interfere with the safe and proper handling of trains; and (d) by giving the old ties to residents along the line, good will is created, especially in districts where timber is scarce, for they use them for fuel, fence posts, cribbing and other purposes. In addition, used in this way they do not represent waste, as they do when burned merely to get rid of them.

Among the disadvantages are that (a) usable material is sometimes taken in error—or in a few cases, by design; (b) the old ties are sometimes removed before they have been inspected by maintenance officers; (c) there is always some hazard in allowing outsiders to work on the right of way without supervision; and (d) at points where the ties cannot be reached by truck or wagon, the railway must make special arrangements for their disposal.

Our policy is to segregate the old ties that have no further value and allow the track supervisors to dispose of them to the best advantage and in the most desirable way. Usually, old ties are given to employees in preference and then to residents along the line. Where no one wants them, as happens in a great many cases, they are burned or disposed of otherwise to keep the right of way clean and presentable at all times.

Is A Good Practice

By W. H. King
Section Foreman, Missouri Pacific Lines, Francitas, Tex.

In many sections of the country fuel is scarce and expensive. Giving old ties to residents along the line saves the expense of piling them and may eliminate a fire hazard of some magnitude. Again, there is always the risk of personal injury when ties are being piled. Taking these items into consideration, I have come to believe that it is good practice to give old ties away to those who want them. I have never experienced any trouble in getting such persons to haul them away at once, as soon as they are released to them. I have found that they also make many uses of them in addi-

tion to that of fuel. I cannot think of one objection to the practice as we have followed it for many years.

Makes Many Friends

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

I know of no reason why surplus old ties should not be given away, for they are of no value to the railway except for temporary cribbing or to stop washes in streams. This must be done, however, with the distinct understanding that they will be hauled away without delay. There is probably no better way for section foremen and supervisors to make friends for the railway than to dispose of old ties in this way. There are many places where fuel is scarce, and the old ties make a welcome addition to the winter's stock. Again, a man who stands in this need is usually unable to understand why the ties are refused him and then burned. In such cases he becomes somewhat resentful, and the railway has lost a friend.

Some states specify the time for burning the right of way and the old ties in the mountains, in which event the ties may be held for considerable periods before they can be burned, and may become very dry and inflammable, creating a fire hazard. In such situations it is of real value to the railway to be able to get residents to take them away as soon as they have been inspected by the supervisor.

Keeping Insects out of Paint

What can be done to keep insects away from fresh paint?

Add An Aromatic

By L. G. Byrd
Supervisor Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

During certain seasons and especially in the early and late hours of the day, we sometimes experience difficulty with insects alighting on fresh paint surfaces. Usually gnats and mosquitoes are the worst pests in this respect. We find that we have more trouble of this kind as we go south, and where the line crosses lowlands, swamps or other places where mosquitoes breed in large numbers. In general, this is not a particularly serious matter, so far as the priming and body coats are concerned, but where they become entangled in the finish coat, the job looks unsightly.

During reasonably calm weather, it is possible to keep practically all insects away from paint, except those that fly headlong, by adding about a tablespoon of oil of citronella or oil of wintergreen to each gallon of paint. These oils are aromatic and have a penetrating odor that repels insects, especially gnats and mosquitoes, which are our worst pests, particularly with respect to the finish coat. The odors of these oils persist until the paint films have hardened beyond the sticky stage and there is no longer any danger that insects will become entrapped.

This precaution does not eliminate the possibility that insects will be blown against the paint, and is, therefore, more or less ineffective when a strong breeze is blowing. However, we have found this expedient quite satisfactory under most other conditions. If paint is applied during the middle of the day, after the cool hours of the morning and before the insects start out in the evening, little trouble will be experienced with them.

Where insects are quite troublesome and a strong breeze is blowing, a canopy or tarpaulin guard will protect the fresh paint from insects and at the same time will avoid damage to vehicles, clothes and other nearby buildings from flying paint and fumes. Again, an electric fan blowing directly away from the fresh paint, if set about 3 ft. from the side of the building, will blow the insects away.

Several Oils Effective

By General Building Inspector

Oil of cedar, oil of citronella and oil of wintergreen, all of them fragrant with strong odors, and all of them repellant to most of the insects that bother fresh paint, can be added in small quantities to the mixed paint before it is applied. About one tablespoon of any of them will be sufficient, and no larger quantity will be more effective, for the odors from these oils are quite penetrating. They have the further merit that they do not affect the paint in any appreciable way, either favorably or unfavorably.

They are particularly effective when the air is quiet and retain this effectiveness until the paint film has hardened sufficiently so that it will not hold insects that light on it. When a strong breeze is blowing, however, gnats and mosquitoes, which are the worst offenders, may be blown against the paint and become entangled in it, regardless of the repellent odor. To guard against this situation it may be desirable, where insects are particularly bad, to set up a windbreak of tarpaulins, or in some cases to suspend the painting for a short period.

Providing Fire Guards

Are fire guards along the right of way desirable? Under what conditions? How should they be made? Of what width? Where located?

Yes, Where Hazards Exist

By H. B. Christianson
Division Engineer, Chicago, Milwaukee, St. Paul & Pacific, Savanna, Ill.

Cleaning and burning the right of way by the section gangs usually affords adequate protection against the spread of fires to adjacent property. There are certain places, however, and in some cases almost entire divisions, where it is desirable to provide additional protection to prevent serious damage to adjacent property. This is done by plowing strips, usually outside the right of way, of sufficient width to stop a fire that originates on the right of way, and far enough so that live sparks cannot drop beyond the plowed strip.

Regions where general use is made of fire guards have hot, dry summers, as in the western Dakotas and eastern Montana. Brisk winds in these wide open spaces may carry sparks beyond the right of way limits. For these reasons, the guards are usually placed as far as practicable from the track, sometimes as much as 200 to 300 ft. More generally, however, the distance is between 100 and 200 ft.

One method is to plow two strips of four furrows each, separated by an unplowed strip about 15 ft. wide, which is burned later. Another is to

plow a single strip six to eight furrows wide, having a total width of about 8 to 10 ft. Obviously, permission must be obtained from the land owners, and usually they are quite willing to grant it.

On one division in western Iowa, where our right of way is bordered by large grain fields, it has been desirable to plow a guard six furrows in width, 50 ft. beyond the right-of-way fence, immediately after the grain is harvested. To do this, a tractor is employed to pull a gang plow which is operated over the entire 30 miles affected by the fire hazard. Immediately after the fire guard has been completed, the section gangs burn the entire strip between the guard and the track.

On a roadmaster's district in Northwestern Illinois, there is but one fire guard about a half-mile long, where the track is on a gradient of 1 per cent. Here it has been found desirable to plow a six-furrow strip 125 ft. from the track on the north side, to guard against the spread of fires that might be started from sparks thrown out by locomotives on the heavy pull over this gradient. On the other hand, two roadmasters who have worked for many years on various divisions in the Middle West, have never found it necessary to plow fire guards, although they are familiar with the practice and are convinced that fire guards are necessary under certain conditions. One of them has a troublesome stretch through a marsh where considerable hay is stacked. He cannot use a plow, but mows and burns the land to a width of 125 ft. beyond the track.

On another roadmaster's district there is only one fire guard, which surrounds a grove of pine trees to which the owner attaches a high value. A fire guard is plowed around the grove every year, after which it is watched carefully and kept clean by discing. In this case, the grove itself is believed to be beyond the reach of any live sparks from passing locomotives. Still another roadmaster whose territory is in a rich farming district, has not been very successful in obtaining permission from adjacent owners to plow fire guards on pastures or hay lands, but finds them willing to co-operate whenever it becomes desirable to plow on stubble land.

They Are Desirable

By Division Engineer

Fire guards are desirable wherever there is danger of fire creeping onto adjacent property, particularly on land upon which small grains, hay and similar crops are raised, as well as on pasture and timber lands. Obviously, this is not practicable in all cases, owing to the nature of the ground, and it often happens that farmers object to having pasture land plowed. There are many places, such as corn fields, market gardens, and similar cultivated areas where the land is kept clear of vegetation other than the crop itself, where fire guards would serve no useful purpose.

Occasionally, one finds a land owner who is not inclined to co-operate. I recall an instance of this sort in which the right of way had been burned carefully, but the farmer would not consent to a fire guard because the area immediately adjacent to the railway was in pasture. A locomotive with a defective screen threw sparks over to the pasture and started several fires. Owing to a high wind, the fire spread rapidly, consuming a large field of grain that had been harvested but was standing in shocks, and several of his farm buildings. Although the company was compelled to pay the damage, this man was anxious to co-operate the following year.

In general, fire guards should be plowed to a width of 8 to 10 ft. and should be located from 100 to 125 ft. from the track. In special cases, I have found it desirable to plow two parallel lines from 20 to 30 ft. apart and burn the intervening strip. In other cases, especially along heavy grades where the locomotives are worked hard, and in sections subject to high winds, it may be desirable to extend the guards farther from the track, but rarely more than 150 ft., for sparks are usually dead by the time they have been carried this far.

Restricting Slow Orders

In view of the present limitations on the placing of slow orders by reason of faster schedules, what provision should be made for the protection of bridgemen when working under traffic?

Maintain a Lookout

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Obviously, shortening the schedules of both passenger and freight trains has, in a measure, brought new problems in the protection of bridgemen when working under traffic, but in the main it has merely aggravated the conditions under which they have been working and has thus magnified the problems that already existed. When bridgemen are working on trestles or steel bridges or under such structures, they have been required, where practical, to move off or from under the structure and stand not closer than 15 ft. from the track while trains pass, to avoid injury from falling coal or parts detached from the equipment.

This practice can be carried out on a large percentage of our bridges. On the other hand, there are some structures where it is difficult or impracticable for the men to leave their work and get in the clear every time a train passes. In such cases, it is our practice to construct a temporary canopy over the men to guard against injury from falling objects. While this is seldom necessary, it does occur on high structures and where the men are working over water. Elsewhere the foreman or some member of the gang keeps a close lookout for approaching trains and warns the men to get into the clear. In most cases they are able to climb down ladders to reach the ground, or up to the deck where they go to the end of the bridge.

Fundamentally the Same

By General Inspector of Bridges

Fundamentally, the problem of protecting bridgemen when they are working under traffic has not changed with the advent of shortened schedules and the practical elimination of slow orders; high-speed operation has only made the problem more difficult of solution. A new phase of the problem, however, is that every man in a gang that is working under high-speed traffic must be more alert mentally and more nimble physically than was necessary only a few years ago. In other words, these jobs are young men's jobs now, and we are losing something by the fact that the average experience and skill are lower today than they were only a short time ago.

Foremen have always been held responsible for the safety of the men working under them, and this responsibility has been greatly increased by the higher speeds that must be permitted over a large percentage of the bridges that are undergoing repairs.

It is not enough to rely on timetables and lineups to determine when to get in the clear; a constant lookout for approaching trains must be maintained, and warning must be given the men whose safety may be affected by the passage of these trains in ample time to enable them to reach places of safety.

Every man in the gang should be trained to get in the clear as soon as he receives warning that a train is approaching, and to place any tools he has been using where they will not be struck or dislodged. If he is on the deck, he should go to the end of the bridge. Long bridges should have refuge platforms at the elevation of the deck for the safety of the men. Those working below the deck should climb down to the ground if they are unprotected, to insure that they will not be struck by coal from the engine tank, or by objects falling from cars.

Since the final responsibility for the safety of his men rests on the foreman to see that his men reach points of safety, he must be alert to see that they take the proper measures for their own safety. Obviously, his attention must be given to the work of the gang. For this reason, it is best to assign a reliable man to act as a lookout for approaching trains. The foreman can then concentrate on his work until the warning is given.

Picking Up Scrap

How many men should be assigned to gathering, sorting and loading released and surplus material after a rail gang? How should they be organized?

System Saves Time

By District Engineer

Like every other operation involved in track maintenance, system in the handling of released and surplus material will not only save manhours, but will add to the safety with which the men work. First of all, however, there should be little surplus material to pick up, for both economy and good practice demand that, while a margin of safety in the supply of bolts, spikes, spring washers, tie plugs, tie plates, anti-creepers etc., must be maintained, it is wholly unnecessary to have a large surplus of these items or to unload the surplus along the track. It is far better to hold the extra material on a push car that moves along with the gang, where it will be available in a moment if, through some error in distribution, a shortage develops at any point in the work.

From several points of view it is objectionable to allow released material to remain in the track longer than is necessary. For this reason, an advance guard of the salvaging organization, consisting of two or three men, should remove joint bars, bolts, spikes, spring washers, anti-creepers and tie plates from the track and pile them in small piles at the side of the track, to clear both the new and released rail.

In a fully mechanized rail gang, one man is seldom able to pick up spikes and bolts and place them outside the track, and two men rarely have the time to do much sorting, although they can generally do some. Certainly, however, two men can keep the joint bars, bolts, spikes, spring washers and anti-creepers segregated and place them in separate piles. These men should get these materials picked up and out of the way of the men who throw out the rail. The third man should follow immediately behind the men who bar out the rail, picking up the tie plates and piling them neatly but separated enough from the piles of other materials so that the men in the loading gang will not interfere with each other.

These men are in advance of the distribution of new material and are, therefore, not in position to look after surplus items. For this reason, there should be a fourth man to follow behind the unit that applies the anti-creepers, who should not only gather any surplus items, but also any released materials overlooked by the forward salvaging unit.

It is just as undesirable to allow materials to remain alongside the track as in the track. Furthermore, in a properly organized rail-renewal operation, the surfacing gang should follow immediately behind the rail gang, certainly not more than one or two days in the rear. This then becomes a further incentive for getting the released material picked up. The loading train should work closely behind the rail gang, cleaning up every item of material, from the rail down to the smaller items. There should be a car for new materials and separate cars for each of the different classes of released materials.

Little benefit will be gained by attempting to classify the released rail in the field; this should be done more deliberately at some point where it can be examined carefully. The remaining materials should be sorted into usable material and scrap, the scrap being loaded at one end of its car and the usable material at the other. These requirements then determine the number of men and their organization. There should be 5 men loading rail, 3 on the ground and 2 in the car; 2 men loading joint bars and 1 man in the car; 3 men loading bolts and spikes and 1 man in each car; 2 men loading tie plates and 2 men in the car; 1 man loading surplus material and 1 man in the car; and 1 man loading spring washers and anti-creepers, with 1 man in the car. This totals 21 men, not including the crane operator or the foreman of the gang. I have done the loading with less men, but the sorting is likely to suffer if too few are employed.

Keep the Track Clean

By Supervisor of Track

By the time the old rail is thrown out, no released material should remain in the track except the tie plates, and they should be piled neatly on the shoulder of the roadbed as soon as they are uncovered. Three men can keep the track clear of material, and one man should be sufficient to gather up surplus material that may be left as the gang passes.

Safety and economy, as well as appearance, dictate that the released material be loaded currently with the rail renewal, and the loading gang should be considered part of the rail gang, working under the same general foreman. It is desirable to separate usable material from scrap, and this will require a few more men than where the material is loaded without sorting. The loading train should include cars for loading the rail, which should be placed at the head end so that the rail will be out of the way of the small material. The car for joints should be behind the rail cars and should be followed by separate cars for spikes, bolts and tie plates, with one car for spring washers and anti-creepers and another for surplus material. The small material can then be loaded as the train moves forward slowly to pick up the rail. Normally, one or two men will be needed in each of the cars, with one to three men on the ground to load. These, together with five men handling the rail, the crane operator and the foreman, total 22 men.

What Our Readers Think

Comments on Stringlining Technic

Evansville, Ind.

To The Editor:

I have read with considerable interest the article in August issue, A Weakness of Stringlining and Its Correction. I have encountered similar difficulties myself, but I believe that they can be overcome very satisfactorily without the use of a transit. One of the main reasons for stringlining is that no transit is required, and if we have to carry one around to supplement the string, one of the main arguments for the use of stringlining is defeated.

My own experience has been that the "goose neck" which occasionally develops at the end of a curve is usually encountered when the calculations show an outward throw near the point of tangent. It is rarely found where the spirals are lengthened and the lining is inward near the point of tangent. However an error may be introduced with the calculations in either case, as was outlined in the above mentioned article.

I believe, though, the reasons for such errors may be divided into two main branches: First—The recording in the notes of measured mid-ordinates on the tangent, which are really not mid-ordinates at all, but merely irregularities of the tangent. These irregularities should be corrected, but if not corrected, they should not enter into the calculations, but should be considered as zero. If treated as zero they will not affect the calculations, but merely remain local irregularities. If treated as mid-ordinates they will be carried forward in the calculations and multiplied, and a slight "goose neck" may result, unless the readings are very precise. Second—A common error is the overreading of the mid-ordinates in the vicinity of the point of tangent. By this, I mean reading a greater value for the mid-ordinate than the actual value. When low values of the mid-ordinates such as 1, 2, 3, 4, or possibly higher, are measured, the string may be touching the rail at other points than the ends, resulting in false readings. Other factors to be guarded against in this connection are: reading the middle of the string instead of the side of the string nearest to the rail, and overreading by not holding the rule in a horizontal position.

The middle of the string should never be read, but always the side of the string nearest to the rail. This is especially true of readings close to the points of tangent where the mid-ordinates are small and any error is proportionately larger. In case the string is half way between the scale marks it is best to drop the half unit and to lean towards under-reading rather than over-reading near the point of tangent. Over-reading increases the plus values, producing an out shift which may extend outside the tangent, producing a reverse curve, whereas under reading increases the minus values tending toward an inshift which is in the same direction as the spiral and continuous with it and nearly always unnoticeable or negligible.

A very simple expedient will enable one to get accurate readings near the point of tangent and on the tangent, without the use of a transit. Merely insert small blocks of the same thickness between the ends of the string and the rail. This will insure the string touching only at the ends and will allow one to get minus readings where they occur. The thickness of the blocks should, of course, be deducted from the reading at the middle. I find that small wooden cubes measuring ten units (0.10 ft., if this unit is used) in each direction, are very convenient.

As an example, I submit the following very careful measurements made of an actual curve:

Measurements With and Without Blocks

Stations	Readings Without Blocks	Readings With 0.10' Blocks	Corrected Mid-Ordinates
0	1	10	0
1	0	8	–2
2	4	14	4
3	3	12	2
4*	2	11	1
5	7	17	7
6	12	22	12

*Apparent P. T. as seen in the field

Note that stations 0, 1, 3 and 4 are over-read without using blocks, for a total error of five units. In the last column the corrected readings for stations 1, 2 and 3 are not mid-ordinates of the curve, but merely irregularities in the tangent. If the calculations extend above Station 4 they should be regarded as zero. These irregularities can, however, be practically eliminated very easily by two adjustments, as shown in the accompanying table.

As seen in this table, by lining Station 2 in 5 units and Station 3 in 4 units, the tangent is put in very good

Tangent Adjustments

Station	Correct Mid-Ordinates Measured With Blocks	Amount Lined	Mid-Ordinates After Lining
0	0		0
1	–2		½
2	4	–5	1
3	2	–4	½
4	1		3
5	7		7
6	12		12

shape. It is true that there still is a slight discrepancy, possibly due to the measurements not being absolutely correct, or possibly due to the fact that there is still a very light swing in the tangent, but it is so small that for all practical purposes it can be completely ignored and the readings for Stations 1, 2 and 3 can be considered zero, but Station 4 should be considered as having a mid-ordinate of 3.

If the spiral is not lengthened and the calculations do not extend above Station 4, the inshifts at Station 2 and 3 can be ignored and allowed for when the curve is staked out, but if Stations 2 and 3 enter into the calculations, the shifts of 5 units and 4 units, respectively, must be added or subtracted to the final results as the case may be. In this case since they are minus values representing inshifts, they would have to be added to any inshifts calculated for those stations. If they were plus values indicating an outshift, they would have to be subtracted from any inshift calculated for Stations 2 and 3. Calculations for the curve, if properly made, ordinarily should show no outshift near the point of tangent, for in such a case, we would probably get an objectionable "goose neck" at this point.

While I have advocated reducing the mid-ordinates on the tangent to zero, as I believe this is the surest way of avoiding an objectionable "goose neck," there is no reason why the calculations should not be carried forward in the usual manner, using the actual readings obtained, provided such readings are accurate. The main reason for reducing the tangent readings to zero, is that if there is an error it is not carried forward and multiplied twice for each station throughout the calculations.

Thomas Walker
Roadmaster, Louisville & Nashville.

[The article on A Weakness of Stringlining and Its Correction in the August issue, was published to

acquaint our readers more generally with the tangent-offset method of measuring mid-ordinates at the ends of curves, a method which is employed by several roads when stringlinging curves on lines being prepared for high-speed streamlined trains. Rather than ignoring measurements beyond a certain point, as recommended by Mr. Walker, which may produce uncertain results, except possibly for those who are experts at stringlining and who have the judgment, acquired by long experience, to know exactly what they are doing, it is our thought that, if the tangent-offset method is not used, the preliminary lining of the ends of the curve and the tangent to eliminate irregularities at that point before measurements are taken, combined with the use of the blocks, as recommended by Mr. Walker, for accurate measurement of the small mid-ordinates at the ends of the curve, should produce a curve that when finally computed and lined, if the work is done carefully and correctly, will be satisfactory for any of the operating speeds of today.—Editor]

Programming Section Work

Decatur, Ill.

To the Editor:

I have been interested in the discussions of programming section work which appeared in What's the Answer department of the February issue. I do not believe that the person who asked this question received the answers that he expected, for the answers that were published were general rather than specific, and a more practical discussion may be of benefit to many supervisory officers.

Drastic reductions in maintenance-of-way appropriations have been made in recent years, while higher speeds of both passenger and freight trains have necessitated greater refinements in track than were formerly considered essential. There is only one way by which these demands can be met, and that is by stretching the appropriations to cover all essential work. One means of doing this is to increase the efficiency of the small section gangs, and the best way to attain this objective is to program work.

The chief benefits of programming section work are: (a) increased uniformity of work and of progress; (b) greater efficiency of gangs; (c) supervision is closer and easier; and (d) it teaches the foreman to use system in any work he does. It also gives a check on what each gang is doing.

What class of work should be programmed? Almost all classes of maintenance work should be programmed. The first year that this is undertaken the program is not likely to run too smoothly, but it will improve with each succeeding year. This statement is based on the experience on a division having approximately 800 miles of main and branch-line tracks. The main-line rail is of 112, 110 and 90-lb. sections; the ballast is crushed rock, washed gravel and cinders. Main-track sections average approximately 5½ miles of double track or 8½ miles of single track. From April 1 to November 1, the force consists of a foreman and 3 laborers and from November 1 to April 1, a foreman and 1½ laborers to the section.

The Winter Program

In general, the winter program should extend from October 1 to March 15. During this period the following work is outlined: Clean waterways, 2 days; line track, doubling 3 sections, 10 days; clean right-of-way, which is burned off as much as possible, and brush and weeds then cleared with axes, knives and scythes, 30 days; tighten main-track bolts (in this connection a bolt tightener assists in this work, being used on those sections where the most trouble with loose bolts is encountered), 20 days; work over side tracks, 10 days.

Section gangs continue to spot track throughout the winter as weather permits. Ties for renewals are received from December 1 to April 1, and are unloaded and trucked out during the winter and placed where they are to be installed. During December and January, the track supervisor, accompanied by the section foreman, spots the ties that are to be renewed the following season. As early in March as weather conditions permit, rough-track notes are given to the foremen constantly for 10 days to two weeks. Following this, tie renewals are started during the last week in March or the first week in April, depending on the weather.

The Summer Program

Tie renewals, averaging 1,300 to the section, are completed by May 31. During this period the gangs renew ties every week day except Saturday, which is spent in smoothing up track. All other work that can be deferred is omitted during this period, although occasionally it becomes necessary for some of the foremen to smooth rough spots or do emergency work on week days, the gangs going back to their tie renewals as soon as these jobs are completed.

After the ties are renewed, the gangs spend about two weeks smoothing line and surface and doing such other work as has been deferred. They then start their spot-work programs. Saturdays and Mondays during June are spent renewing side-track ties, with the expectation that this work will be completed by June 30.

From the middle of June until September 1, — except Saturdays and Mondays in June—all gangs concentrate on out-of-face spot-program work. Starting at one end of the section, each gang works progressively, spotting, gaging, correcting cross level and lining. A gang will work over an average of about 1,000 ft. of track a day. Two unit tie tampers are assigned to each section having stone ballast.

Switch ties are renewed and turnouts are gone over and adjusted during September. During this month, also, the entire section is gone over carefully to correct any rough-riding conditions. Curves are checked as necessary throughout the year and gaging is done as required. Anti-creepers are watched and given needed attention currently.

During the summer, track mowers cut a swath on either side of the track, and power-driven hand mowers are used for cutting brush at crossings. A ballast-drainage car is used to scarify foul ballast and uproot weeds in the ballast on sections that have chronic trouble with them.

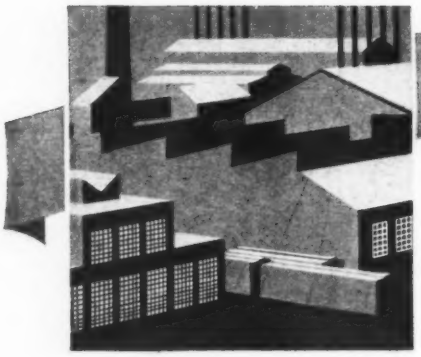
This program has had no adverse effect on the safety with which the men work, for last year the maintenance of way department on this division had only one reportable injury.

Programming also applies to the work on branch lines, but not to quite the same extent. When wrecks, fence requests or unusual track conditions keep a gang off of its program for several days, the foreman is allowed an extra laborer for a few days or is assisted by an adjoining section, provided that gang is well along with its program. To keep a program moving uniformly, it must be cooperative; that is, as any section finishes each step in its program for the period, it assists adjoining sections.

A small chart upon which the progress on the several classes of work is shown, is sent semi-monthly to the division engineer by each track supervisor. This report is forwarded to the chief engineer each month.

This program has been evolved over a period of five years. When first put into practice, the men fell short of the schedule lined up for them, but each year has brought improvement, until we are now able to complete the work on schedule. To us, at least, this is conclusive proof of the effectiveness of programming section work.

Division Engineer



PRODUCTS of Manufacturers

Safe-Line Wire Rope Clamp

THE National Production Company, Detroit, Mich., has developed a new type of wire rope clamp named the Safe-Line, which is being made in stock sizes for wire ropes or cables from ⅛ in. to ¾ in. in diameter, and which is streamlined in appearance, is said to have great holding power, and provides for completely enclosing the severed ends of the wire rope, allowing free and safe handling.

The Safe-Line Wire Rope Clamp Is Streamlined in Appearance and Completely Encloses the Severed Ends of the Wire Rope

The Safe-Line is a friction type clamp, consisting of two tapered and threaded clamping members and two tapered nuts which enclose the clamp and give it a streamlined appearance. The clamping members are double spiral splines, which, when placed together, are similar to a cylinder split longitudinally, tapered and threaded on both ends. The inside surfaces of the splines or clamping members are shaped to fit the sections and strands of the wire ropes.

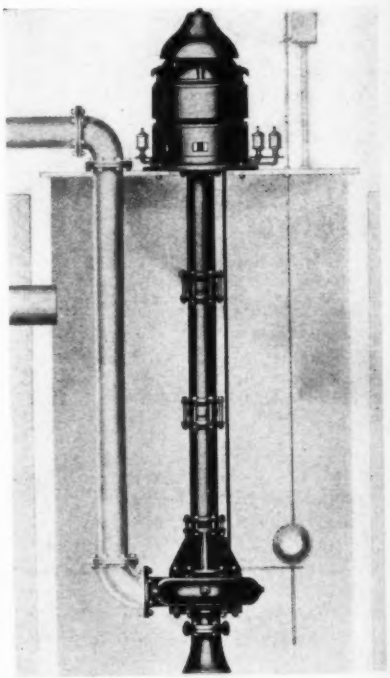
The clamp is easily applied by placing the wire ropes parallel at the point where the clamp is to be applied, fitting the splines over the ropes and applying the nuts at each end, tightening them sufficiently to obtain the proper holding power. A hexagonal reinforcing section at the center of the splines enables them to be placed in a vise, if necessary, while the nuts are being applied. The wire rope may be cut flush with the end of the splines before the nut is applied so that the ends of the wires are totally enclosed. The clamps can also be used on worn wire ropes by placing a steel shim between the two ropes.

The Safe-Line clamp has been approved by the Underwriters' Laboratories, Inc., for use on the strongest wire ropes. It is said that this clamp. unlike many other types, can be quickly readjusted to the proper tension without additional expense, and can be used over and over again, and that, because the pressure of the clamp on the wire rope is distributed evenly on each section and strand over a comparatively large area, it eliminates the cutting action of the clamp on the rope.

New Line of Sump and Bilge Pumps

FAIRBANKS, Morse & Co., Chicago, has developed a complete new line of non-clogging centrifugal pumps designed for intermittent-duty sump or bilge pumping for wet-pit or submerged service. Known as the Fairbanks-Morse 541OSS pumps, they are the latest modification of the A. B. Wood non-clogging centrifugal design and are adapted to the disposal of surface or storm water or drainage of deep basements or underpasses.

The pumps consist of a cast-iron impeller which rotates in a horizontal plane, and which is enclosed in a cast-iron pump casing designed with smooth, streamlined fluid passages. The discharge opening can be placed in any one of eight positions for convenience of installation. The pump is driven by a vertical manganese steel shaft, which is enclosed and protected by steel column sections. The pump bearings are of cast bronze and are protected by a closure seal and cover. The shaft bearings, which are also of bronze and are renewable, are carried in accurately bored bearing spiders and the close spacing of these bearings insures a minimum of drive shaft vibration. The power is usually supplied by a vertical, hollow shaft Fairbanks-Morse electrical motor, although suitable pulley or gear arrangements may be provided for connection with other types of power units. Lubrication is provided by sight feed oil cups with separate oil lines to the pump bearings and shaft bearings.



The Fairbank-Morse 5410SS Pumps Are Available in Capacities Up to 1,400 G.P.M.

The new pumps are designed for suspension from the floor level into a sump or bilge pit. They can be furnished for either clockwise or count-

er-clockwise rotation and with special impellers of bronze or other metals for special service requirements. They are available in 2, 3, 4 and 5-in. sizes for capacities up to 1,400 g.p.m. for heads up to 120 ft. and settings up to 25 ft. It is said that the 2-in. pumps will pass solids with a maximum diameter of 1½ in. without clogging, that the 3-in. pumps will pass solids with a diameter of 2 in. without clogging and that the 4 and 5-in. pumps will pass solids with a diameter of 3 in. without clogging.

G. E. Arc Welderule

THE General Electric Company, Schenectady, N. Y., has designed a vest-pocket size device called the Arc Welderule, which is operated in a manner similar to a slide rule. It provides various types of welding information quickly and conveniently and is designed to save the time of

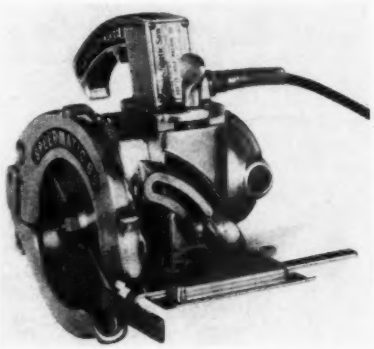
The Arc Welderule Is Operated in a Manner Similar to a Slide Rule

welders in estimating electrode requirements. It reads directly for 11 different commonly used sizes and types of joints and 22 most commonly used sizes and types of electrodes, the length of arc welded joints obtainable per 100 lb. of electrode and the pounds of weld metal deposited per 100 lb. of electrode. An additional feature of the Arc Welderule is a selector chart which shows the various filler metal classifications specified by the American Welding Society and the types of electrodes which meet these classifications.

Electric Hand Saw

THE Porter-Cable Machine Company, Syracuse, N.Y., has added a new model, known as type K-65, to its line of Speedmatic electric hand saws. This model, which weighs 15.5 lb., has a blade 6½ in. in diameter and is capable of cutting 2-in. material. It is powered with a ⅝-hp. Universal motor, and the blade operates at a speed of 7,200 r.p.m. Through the use of a helical cut-gear drive in this tool, it is said that 98 per cent of the motor power is transmitted to the drive shaft.

For depth adjustments, the base may be raised and lowered and may



The Porter-Cable Type K-65 Speedmatic Saw

also be tilted to an angle of 45 deg. for cutting bevels. To permit the saw to be adjusted rapidly and with accuracy, a cast-in enameled scale is provided. The frame is of die-cast polished aluminum. Standard equipment provided with this saw includes a combination saw blade, a ripping guide, a cross-cutting guide, 15 ft. of insulated conductor cable with plug and socket, a metal carrying case, and a wrench for changing blades.

Hi-Ball Switch Heater

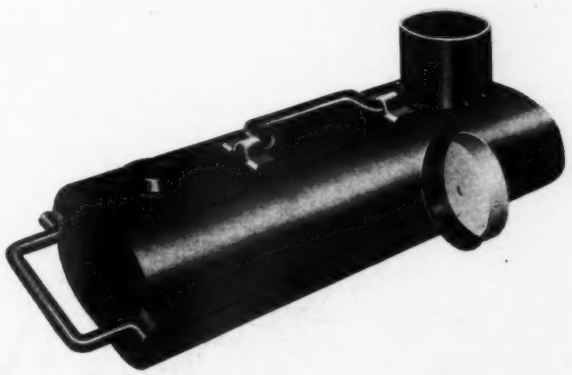
THE Mississippi Supply Company, Chicago and St. Paul, Minn., has developed the Hi-Ball Switcher Heater, which is said to be economical to operate, to provide an exceptionally dependable flame and to eliminate fire hazards. This heater is of all-welded construction, made of 16 gage steel. It consists of an oval tank about 3½ in. high and 18 in. long, with a wick at one end and a cap for filling the tank with kerosene at the other. Around the wick is a small stack or chimney which confines and protects the flame and concentrates the heat on the base of the rail. Four holes at the base of the stack provide a draft for the flame.

The heater uses a ⅝-in. round wick in a ½-in. hole provided by a ½-in. tube which extends into the tank. The portion of the tube within the tank is split to allow the wick to absorb kerosene at any point along its length. Two handles are provided, one on top to carry the heater when it is out of the track, and the other at the end to aid in placing the heater under the rail.

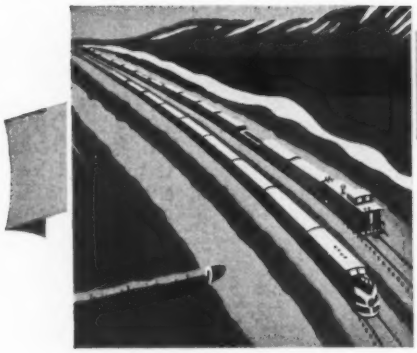
The Hi-Ball Switch Heater is placed between the ties, with the flame under the base of the rail within the limits of the switch. It is said to be easy to place without digging out a large amount of ballast. Twelve to 24 heaters are usually required per switch, depending upon the length. The heaters will operate 30 to 40 hours on less than 1½ gal. of kerosene, making it necessary to fill them only once a day during daylight hours. The only other care required is to trim the wick occasionally. This can be done when the heaters are being refueled.

This heater has been in service under severe winter conditions for two winters in terminal areas and in main line tracks of a large railroad over which high-speed streamlined trains were operated and in the period no instance was reported of one of the heaters being blown out or of fire or damage to the ties. In addition, tests, with favorable results, were also made to determine the heating effect on the rail, to be sure that the heaters, with their confined flame, did not overheat the base of the rail.

In addition to dependable operation, low fuel consumption and low maintenance and operating costs, this heater is said to be more economical to install because the flame is not exposed, making it unnecessary to install asbestos or tin shields on the ties. For the same reason the fire hazard is said to be eliminated.



The Hi-Ball Switch Heater Is Said to Operate 30 to 40 Hours on Less Than 1½ Gal. of Kerosene



NEWS of the Month

Mexican Railroad To Be Reconstructed

Avila Camacho, president of Mexico, has ordered the National Railways of Mexico to reconstruct the Tehuantepec Railroad, because of the possibility that traffic through the Panama Canal might be interrupted. The capacity of the road, which extends from Coatzacoalcos, Veracruz, on the Gulf of Mexico to Salina Cruz, Oaxaca, on the Pacific Ocean, a distance of 188 miles, is to be increased to 80 trains a day by laying 112-lb. rails, by the reinforcement of the roadbed and by improvements to the yards. The cost is estimated at 12 million pesos.

President Names Transportation Study Board

On July 24, President Roosevelt sent to the Senate, and on August 11 that body confirmed, the nominations of C. E. Childe, transportation counsel, Omaha, Neb., and Robert E. Webb, chairman of the Kentucky Railroad Commission, together with Nelson Lee Smith, chairman of the New Hampshire Public Service Commission, who had been nominated previously, to be members of the transportation study board called for in the Transportation Act of 1940. The nomination of Charles West, whose name was submitted with those of Wayne Coy and Mr. Smith on March 29, was withdrawn. As reported in the July issue, the nomination of Wayne Coy had been withdrawn previously by the President.

Railroad Construction Costs Show Increase

The Engineering Section of the Interstate Commerce Commission's Bureau of Valuation has issued its annual report on Railroad Construction Indices for 1940, showing "a definite trend upward in railroad costs." Based on the 1910-1914 costs as 100, the 1940 index for the country as a whole was 153, up four points as compared to 1939, and 20 points above the 1933 post-war low of 133. The peak was reached in 1920 when the index stood at 226. The roadway accounts, which reached 214 in 1920 and hit a low of 127 in 1933, were up to 140, three points more than in 1939. The increases in roadway accounts were credited principally to higher prices for steel and timber. Buildings, up about seven per cent, showed the greatest increases. In the total of 54 accounts covered by the indices, only one, Account 3-Grading, has fallen below the 1910-1914 base of 100. The index figure for this account was 214 in 1920, and now stands at 90. The reason for the decrease in this account is the almost complete mechanization of grading operations that has taken place during the last two decades.

Railroad-Highway Grade Crossing Casualties Increase

In the first six months of 1941, a total of 880 persons lost their lives in accidents at railroad-highway grade crossings, an increase of four compared with the same period of 1940 and an increase of 200 compared with 1939, according to the Safety Section of the Association of American Railroads. This is the greatest number of fatalities in the corresponding period of any year since 1931, when there were 921 fatalities. Persons injured in such accidents in the first six months of this year totaled 2,213, an increase of 36 compared with the same period in 1940 and an increase of 367 compared with 1939.

Railroads Co-operate In Gathering Scrap

The railroad industry has engaged in an intensive effort to produce as much steel scrap as possible to aid the Office of Production Management in its efforts to alleviate the scrap shortage. The clean-up drive got under way as the result of a suggestion from Ralph Budd, defense transportation commissioner, to J. J. Pelley, president of the Association of American Railroads, whereupon the A. A. R. requested reports on scrap which might be available from cars and locomotives scheduled for dismantling. Replies have indicated that 150,000 tons of scrap would be available from that source. This suggestion was followed by several others, including the possibility of obtaining additional steel scrap by taking up unused yard and industry tracks, tracks embedded in streets, and removing rails on abandoned lines and lines with respect to which abandonment proceedings were pending.

Services of Mediation Board Invoked in Wage Negotiations

After negotiations failed between the managements and railroad unions on the proposals of certain railways to change working rules and on the demands of the brotherhoods for increased pay, which were reported in the July and August issues, the services of the National Mediation Board were invoked, and closed hearings were begun at Chicago on August 14, and are still continuing. As previously reported, the main issues under mediation are the demand of the five operating unions for an increase in pay of 30 per cent; the demand of the 14 non-operating unions for a minimum wage of 70 cents per hour as the lowest rate to be paid in the industry, with other corresponding increases which would provide rates up to $1.15 per hour for highly-skilled workers; and the proposals of the railroads to change working rules. It is expected, however, that former demands of the non-operating unions for vacations with pay and counter proposals of the western railroads to reduce wages 10 per cent will also be considered during the mediation proceedings. The three members of the National Mediation Board who are participating in the conferences are David J. Lewis, chairman, George A. Cook and Otto S. Byer.

All Steel Placed Under Priority Restrictions

Steel in all its forms, including alloy steel, was placed under full priority control on August 9 in an order issued by E. R. Stettinius, Jr., director of priorities, Office of Production Management. The order places all iron and steel products under mandatory priorities; and while alloy steels are thus included, a separate order will be issued giving details of the regulations applying to alloys. A similar order putting pig iron under full control was issued August 6. One effect of the order was expected to be a more speedy release of plates to builders of railway equipment. With the A-3 rating assigned them, materials for cars and locomotives qualify as defense materials at a relatively high place on the scale, since anything with a rating of A-10 or higher is called a defense order. In this connection OPM's Division of Production announced on August 7 that OPM Director General Knudsen had recommended to Federal Loan Administrator Jones federal financing for the construction of a 780,000-ton plate mill at the Sparrows Point, Md., plant of the Bethlehem Steel Company, "as a partial solution of the critical plate situation growing out of the naval and merchant ship construction programs, railroad car building and other defense undertakings." Meanwhile Priorities Director Stettinius has also announced a new Maintenance and Repairs Rating Plan to assure "a steady flow of maintenance and repair parts to essential industries." The plan is applicable at once to nine industries, including the railroads. Under the OPM plan, the repair materials will get an A-10 rating, which, as noted above, is the lowest in the defense category. A special emergency rating of A-1-a may be assigned "in cases of extreme emergency such as sudden breakdown, accident, fire or storm damage."

Personal Mention

General

E. T. Barrett, division engineer on the Denver & Rio Grande Western, with headquarters at Grand Junction, Colo., has been appointed acting trainmaster, with the same headquarters.

Carl W. Baker, trainmaster on the Lehigh Valley, with headquarters at Buffalo, N. Y., and an engineer by experience, has been promoted to assistant superintendent of the Wyoming division, with headquarters at Wilkes-Barre, Pa. Mr. Baker was born at Hazleton, Pa., in 1899 and after a public school education he entered railway service with the Lehigh Valley in 1921 as a member of the engineering corps at Hazleton. In 1925, Mr. Baker was promoted to assistant engineer at the same point, being transferred to Buffalo in 1927. He was further advanced to division engineer with the same headquarters in 1938, being promoted to assistant trainmaster at the same point in April, 1940, and to trainmaster in July, 1941. His further promotion to assistant superintendent followed a month later.

R. M. Smith, whose promotion to trainmaster on the Missouri Pacific, with headquarters at Bush, Ill., was reported in the June issue, entered railway service in 1911 as a rodman on the Missouri Pacific, later serving as a transitman, building inspector and assistant engineer. In 1925 he was promoted to division engineer at Van Buren, Ark., and in the latter part of 1926, he was transferred to Wynne, Ark. Mr. Smith was promoted to assistant engineer maintenance of way, with headquarters at St. Louis, Mo., in 1929, and the following year, when his position was abolished, he was appointed division engineer at Coffeyville, Kans. In May, 1933, he was advanced to assistant superintendent, with headquarters at Pueblo, Colo., and in April, 1939, he returned to the engineering department as division engineer of the Missouri and Memphis divisions, with headquarters at Poplar Bluff, Mo., which position he held until his recent promotion.

Mark C. Williams, superintendent of the Oregon division of the Union Pacific, with headquarters at Portland, Ore., and an engineer by training and experience, has been promoted to general superintendent of the Northwestern district, with the same headquarters. Mr. Williams was born at Delaware, Ohio, on August 29, 1882, and studied civil engineering at the University of Denver and the University of Colorado from 1903 to 1906. He entered railroad service in 1901 as a rodman on surveys for the construction of the Denver & Salt Lake. He returned to railroad service in October, 1906, as a draftsman for the Oregon-Washington Railroad & Navigation Co. (now part of the Union Pacific) and was later advanced successively to transitman, locating engineer and resident engineer on location and construction work. On February 1, 1914, he was promoted to division engineer, with headquarters at Walla Walla, Wash., and on June 1, 1917, he was transferred to Portland. In August, 1927, Mr. Williams was appointed acting superintendent, with headquarters at Spokane, Wash., and on December 1, 1927, he was promoted to superintendent at that point. In October, 1937, he was transferred to the Oregon division, with headquarters at Portland, the position he held until his recent promotion.

George H. Warfel, personnel assistant on the staff of the president of the Union Pacific, with headquarters at Omaha, Neb., and a maintenance officer by training and experience, has been advanced to assistant to the vice-president-operations, in charge of the labor relations department, with the same headquarters. Mr. Warfel was born at Ladoga, Ind., on March 28, 1884, and entered railway service on August 15, 1901, as a laborer in the signal department of the Union Pacific. He later became successively a batteryman, repairman, maintainer and district signal maintainer at Point of Rocks, Wyo. Mr. Warfel was

George H. Warfel

appointed assistant roadmaster at Kearney, Neb., in March, 1910, and was promoted to roadmaster at that point in 1912. In May, 1926, he was promoted to general roadmaster, with headquarters at Kansas City, Mo., and in November of that year he was transferred to Omaha, Neb. On January 1, 1927, he was promoted to assistant to the general manager, in charge of safety, at Omaha, and in February, 1935, he was advanced to assistant superintendent of the Nebraska division, with headquarters at North Platte, Neb. Mr. Warfel was promoted to superintendent of the Wyoming division, with headquarters at Cheyenne, Wyo., in February, 1937. He was later appointed assistant superintendent at North Platte, and on March 14, 1939, he was appointed acting superintendent at Kansas City, a short time later being advanced to superintendent at Kansas City. In July, 1941, Mr. Warfel was promoted to personnel assistant, on the staff of the president, with headquarters at Omaha, which position he held for several weeks until his recent promotion.

G. R. Haworth, general superintendent of the Western Maryland and an engineer by training and experience, has been promoted to general manager, with headquarters as before at Baltimore, Md. Mr. Haworth was born at Philipsburg, Pa., on June 25, 1888, and entered railroad service in 1905 as a rodman on the Centre and Clearfield. In 1906 he became a rodman on the Buffalo & Susquehanna, and, in 1907, a rodman on the Erie, the latter with head-

G. R. Haworth

quarters at Hornell, N. Y. Later in 1907 he worked as a levelman for the city surveyor in New York, and as a recorder in the marine survey and dredging department at New York. In 1908 he returned to the Erie as a concrete inspector at Cuba, N. Y. During 1909 Mr. Haworth was employed as a foreman in the Pennsylvania state highway construction department, with headquarters at Pittsburgh, Pa., and as a levelman on the Chicago, Burlington & Quincy. He was appointed a transitman in 1910, in charge of a field party for the Chicago, Burlington & Quincy, and later in that year he was employed as a surveyor for the United States Engineers. In 1911 he went with the Western Maryland, serving successively as an instrumentman in West Virginia and a resident engineer at Hagerstown, Md. He was transferred to Baltimore in 1912 and in 1914 he was employed as an engineer on the construction of the Johns Hopkins Engineering School. Later in the same year Mr. Haworth returned to the Western Maryland as a resident engineer. In 1924 he was appointed division engineer in charge of maintenance and construction on that road, remaining in that position until 1936, when he became engineer maintenance of way at Baltimore. In May, 1940, Mr. Haworth was promoted to general superintendent, the position he held until his recent appointment.

Engineering

W. G. Dyer, roadmaster on the Canadian Pacific at Lanigan, Sask., has been promoted to division engineer, with headquarters at Moose Jaw, Sask., succeeding **H. R. Miles,** who has retired.

J. F. Zanolio, master carpenter on the Denver & Rio Grande Western at Alamosa, Colo., has been promoted to acting division engineer at Grand Junction, Colo., succeeding **E. T. Barrett,** whose appointment as acting trainmaster is reported elsewhere in these columns. **W. B. Jacobson,** engineering assistant at Grand Junction, has been appointed acting assistant engineer at Salt Lake City, Utah, relieving **W. C. Blackaller,** whose appoint-

ment as acting master carpenter at Alamosa is reported elsewhere in these columns.

Peter V. Thelander, assistant engineer in the office of the engineer of maintenance of the Chicago & North Western, has been promoted to division engineer of the Peninsula division, with headquarters at Escanaba, Mich., succeeding **S. S. Long,** who has been transferred to the Lake Shore division, with headquarters at Green Bay, Wis. Mr. Long relieves **J. A. Dyer,** who retired on August 1.

A. T. Kinne, assistant division engineer on the Louisville & Nashville, with headquarters at Birmingham, Ala., has been promoted to division engineer, with headquarters at Nashville, Tenn., succeeding **R. A. Bryson,** who has been granted a leave of absence, and **E. C. Haynie,** track supervisor at Anniston, Ala., has been advanced to assistant division engineer at Birmingham, relieving Mr. Kinne.

J. W. Treadwell, whose promotion to division engineer of the Missouri and Memphis divisions of the Missouri Pacific, with headquarters at Poplar Bluff, Mo., was reported in the June issue, entered Missouri Pacific service in 1920 and has served as an instrumentman, rodman, extra gang time keeper and acting roadmaster. In the latter part of 1926 he was promoted to roadmaster at Gurdon, Ark., and in May, 1929, he was transferred to El Dorado, Ark. In 1934 he was transferred to Monroe, La., and in 1937 to Benton, Ark., where he remained until his recent promotion.

N. C. Pearson, division engineer on the Union Pacific at Kansas City, Mo., has been promoted to district engineer of the Northwestern district with headquarters at Portland, Ore., succeeding to a portion of the duties of **W. C. Perkins,** district engineer of both the Northwestern and South-Central districts, who continues as district engineer of the South-Central district, with headquarters at Salt Lake City, Utah. **R. M. Jolley,** assigned to the office of the chief engineer at Omaha, Neb., has been appointed division engineer at Kansas City, Mo., replacing Mr. Pearson. **T. L. Pidcock,** assistant engineer on the Idaho division, has been promoted to division engineer of the newly created Utah division, with headquarters at Salt Lake City.

J. R. Prizer, assistant division engineer of the Lehigh & Susquehanna division of the Central of New Jersey, whose promotion to division engineer of the same division was announced in the August issue, was born on March 22, 1886, and attended Ursinus college, Collegeville, Pa., and Lehigh university, from which he graduated in civil engineering in 1908. Mr. Prizer entered the service of the Jersey Central on May 9, 1909, as a rodman at Mauch Chunk, Pa., becoming a bridge inspector at the same point on October 15, 1915. On September 1, 1917, he was promoted to assistant engineer at Mauch Chunk, and on January 27, 1930, he was further advanced to division engineer with headquarters at Long Branch, N. J. On July 1, 1932, he was appointed assistant division engineer of the Lehigh & Susquehanna division, with headquarters at Mauch Chunk, which position he held until his recent promotion to division engineer.

Fred A. Bordwell, whose retirement on July 1 as division engineer of the Western division of the Southern Pacific, with headquarters at Oakland Pier, Cal., was reported in the July issue, entered railway service in September, 1899, as a draftsman on the Western division of the Southern Pacific, and in 1905 was promoted to assistant engineer at Sacramento, Cal. He was transferred to the Western division in 1906 and in 1907 he was promoted to division engineer, with headquarters at Tuscon, Ariz. A short time later Mr. Bordwell left railway service to engage in private business but returned to the Southern Pacific in May, 1912, as assistant engineer on the Western division. During the first World War he served as a captain in the Engineer Corps, returning to the S. P. in 1919 as division engineer at San Joaquin, Cal. In February, 1938, Mr. Bordwell was transferred to the Western division, with headquarters at Oakland Pier, where he remained until his retirement.

Orville W. Stephens, track supervisor on the Delaware & Hudson, who has been promoted to assistant engineer of structures, with headquarters at Albany, N. Y.,

Orville W. Stephens

as announced in the August issue, was born on May 29, 1900, at Carbondale, Pa. Mr. Stephens attended the New York Military academy and the University of Michigan, graduating in civil engineering from the latter school in 1925. He first entered railway service with the D. & H. in June, 1917, as an apprentice inspector in the car department, and during subsequent summer vacations from school he served in the engineering and maintenance departments as a trackman, chainman and rodman. In July, 1925, Mr. Stephens became a draftsman at Plattsburg, N. Y., and on September 1 of the same year he was sent to Carbondale, Pa., as a junior transitman, being advanced to senior transitman at the same point on September 1, 1927. He was further promoted to supervisor of bridges and buildings of the Pennsylvania division on December 1, 1928, being transferred to the Saratoga division on April 16, 1930. On June 1, 1938, Mr. Stephens was appointed track supervisor on the Susquehanna division, the position he held until his appointment as assistant engineer of structures.

Thomas E. McMannis, supervisor of track on the Central of New Jersey, whose promotion to division engineer with headquarters at Jersey City, N. J., was noted in the August issue of *Railway Engineering and Maintenance,* was born on January

Thomas E. McMannis

19, 1898. Mr. McMannis is a graduate of St. John's college, Annapolis, Md., (1918) and of Cornell university (1922). He first entered railway service in August, 1914, as a rodman on the Cumberland and Pennsylvania at Frostburg, Md., serving in this capacity for two years. In July, 1918, after leaving St. John's college, he returned to this company as a draftsman at Cumberland, Md., serving in this position until August, 1920, when he entered Cornell university. In July, 1922, Mr. McMannis entered the service of the Baltimore & Ohio as an assistant on the engineering corps at Pittsburgh, Pa. A month later he left this company to accept a teaching position at Matewan, W. Va. In June, 1923, Mr. McMannis returned to the B. & O. as an inspector for the chief engineer maintenance at Baltimore, Md. In the spring of 1926, he left the B. & O. to go with the Jersey Central as assistant supervisor of track at Jersey City, being promoted to supervisor of track at Somerville, N. J., in January, 1927. He was holding the latter position at the time of his recent promotion to division engineer.

L. G. Walker, whose promotion to assistant division engineer on the Fort Wayne division of the Pennsylvania, with headquarters at Fort Wayne, Ind., was reported in the July issue, was born at Emporia, Va., on July 1, 1908, and graduated from the Virginia Military Institute in 1929. He entered railway service on July 1, 1929, as an assistant on the engineering corps of the Pennsylvania at Chester, Pa., a short time later being transferred to Tyrone, Pa. On June 18, 1930, he was promoted to assistant supervisor of track at Chambersburg, Pa., and was transferred in 1931 to Camden, N.J., and in 1932 to Woodbury, N.J. On May 15, 1932, Mr. Walker was appointed assistant on the engineering corps at Tyrone and on February 1, 1934, he was advanced to assistant supervisor of track at Clayton, Del., a short time later being transferred to the Philadelphia Terminal at Philadelphia, Pa. Mr. Walker was advanced to supervisor of track, with head-

quarters at Oil City, Pa., on January 1, 1936, and on March 15, 1937, was transferred to Camden, N.J. On November 27, 1937, he was transferred to Harrisburg, Pa., where he remained until his recent promotion, effective June 1.

Track

C. L. Elliott, who was appointed acting roadmaster on the St. Louis-San Francisco, with headquarters at Neodesha, Kan., on May 19, has been promoted to roadmaster, with the same headquarters.

L. V. Bledsoe, an extra gang foreman on the Chesapeake & Ohio, has been promoted to supervisor of track, with headquarters at Cane Fork, W. Va., succeeding **W. J. Dixon,** who has been transferred.

W. R. Keay, roadmaster on the Union Pacific at Pocatello, Idaho, has been promoted to general roadmaster, with headquarters at Los Angeles, Cal., a newly created position, and **H. G. Williams** has been appointed roadmaster at Pocatello, succeeding Mr. Keay.

N. D. Bloom, acting roadmaster on the Atchison, Topeka & Santa Fe at Dodge City, Kan., has been promoted to roadmaster at La Junta, Colo., succeeding **A. W. Gobeli,** whose promotion to general foreman of bridges and buildings and water service at Clovis, N. M., is reported elsewhere in these columns.

William T. Fuller, whose promotion to roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Glencoe, Minn., was reported in the June issue, was born at Groton, Ill., on July 17, 1899, and entered railway service in July, 1922, as a section laborer on the Milwaukee. In 1930 he was promoted to section foreman and the following summer he was advanced to extra gang foreman, serving alternately as section foreman in the winter and extra gang foreman in the summer, until his recent promotion.

J. V. Slaughter, whose promotion to roadmaster on the Southern Pacific Lines in Texas and Louisiana, with headquarters at Houston, Tex., was reported in the July issue, was born at Frankston, Tex., on March 22, 1902, and entered railway service as a section laborer on the Southern Pacific on July 12, 1919. On June 1, 1922, he was promoted to section foreman and on December 1, 1937, he was advanced to assistant roadmaster at Houston, the position he held until his recent promotion, effective June 1.

William Meier, whose retirement on June 30 as supervisor of track on the Pere Marquette at Grand Ledge, Mich., was reported in the August issue, was born at Sonia, Mich., on July 15, 1874, and entered railway service on March 29, 1891, as a section laborer on the Pere Marquette. In 1896 he was advanced to section foreman and in 1902 he was promoted to roadmaster, with headquarters at Ionia, Mich. His title was later changed to supervisor of track and he was transferred to Grand Ledge, remaining there until his retirement.

W. A. Enderle, whose retirement on May 31 as roadmaster on the Southern Pacific Lines in Texas and Louisiana at San Antonio, Tex., was reported in the July issue, was born at D'Hanis, Tex., on July 28, 1877, and entered service on the Southern Pacific as a section foreman on January 1, 1906. On September 1, 1913, he left the service to engage in business for himself, but returned on March 1, 1916, as a section foreman and on July 4, 1920, he was promoted to roadmaster at San Antonio and continued in that capacity until his retirement.

Dan L. Cutler, whose promotion to roadmaster on the Chicago Milwaukee St. Paul & Pacific, with headquarters at Horicon, Wis., was reported in the June issue, was born at Peoria, Ill., on May 25, 1902, and entered railway service on July 28, 1918, as a section laborer on the Milwaukee. On April 23, 1923, he was promoted to section foreman at Russell, Ill., and on April 18, 1927, he was advanced to extra gang foreman on the First district of the Milwaukee division. Mr. Cutler continued to serve alternately as section foreman or extra gang foreman until his recent promotion.

C. A. Colpitts, whose promotion to roadmaster on the Canadian Pacific with headquarters at Lloydminster, Alta., was reported in the June issue, was born at Winnipeg, Man., on January 23, 1907, and graduated in civil engineering from the University of Manitoba. He entered railway service in July, 1925, in the mechanical department at the Weston Shops of the Canadian Pacific at Winnipeg, and later served in the construction and operating departments as a chainman, rodman, instrumentman and transitman at various points, his last station before his recent promotion being at Edmonton, Alta.

James Albert Lowry, whose retirement as roadmaster on the Chicago, Burlington & Quincy, with headquarters at Ottumwa, Iowa, was reported in the July issue, was born at Lockridge, Iowa, on October 14, 1877, and entered railway service in May, 1893, as a section laborer on the Burlington at Rome, Iowa. In March, 1896, he became an extra gang laborer on the Ottumwa division and three years later he was promoted to foreman, serving as a section foreman and extra gang foreman on the Ottumwa and Creston divisions until June, 1917, when he was promoted to roadmaster at Ottumwa. His retirement was effective July 1.

R. D. Overholt, transitman and relieving roadmaster on the Canadian Pacific at Saskatoon, Sask., has been promoted to roadmaster at Lanigan, Sask., succeeding **W. G. Dyer,** whose promotion to division engineer at Moose Jaw, Sask., is reported elsewhere in these columns. **E. J. Erickson,** section foreman and relieving roadmaster, has been appointed roadmaster at Strasbourg, Sask., relieving **A. Campbell,** who retired on July 1. **Thomas W. Hicks,** transitman at Penticton, B. C., has been advanced to roadmaster at Princeton, B. C., replacing **S. Kozak,** who has been transferred to Proctor, B. C., succeeding **M. Kubin,** deceased.

John H. Johns, whose retirement on May 1 as roadmaster on the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Horicon, Wis., was reported in the June issue, was born at Newtown, Mo., on April 4, 1872, and entered railway service in September, 1889, as an extra gang laborer on the Milwaukee at Newtown, later serving as a section laborer, assistant extra gang foreman, and extra gang foreman on the Kansas City division. In 1923 Mr. Johns was promoted to roadmaster on the Northern division, with headquarters at Horicon, Wis. In 1925 he was transferred to Tama, Iowa, and in 1926 he was transferred back to Horicon, where he remained until his retirement.

John H. Dame, whose promotion to track supervisor on the Illinois Central at Princeton, Ky., was reported in the June issue, was born at Clarksville, Ark., on April 30, 1894, and entered railway service in November, 1908, as a rodman on the Mississippi division of the Illinois Central, later serving as a laborer on that division. In July, 1913, he was appointed an assistant section foreman, and in July, 1917, he was promoted to section foreman on the Tennessee division, later being transferred to the Kentucky division. In July, 1940, Mr. Dame was advanced to general foreman on the Kentucky division, the position he held until his recent promotion.

James K. Gloster, draftsman in the office of the chief engineer of the Louisville & Nashville, has been promoted to track supervisor, with headquarters at Anniston, Ala., succeeding E. C. Haynie, whose promotion to assistant division engineer, with headquarters at Birmingham, Ala., is reported elsewhere in these columns. Mr. Gloster was born at Middlesboro, Ky., on May 29, 1910, and graduated from the University of Kentucky in 1934. He then worked for two years for a coal company and in 1936 he entered the service of the L. & N. as an instrumentman. In April, 1940, he was transferred to the bridge department in the chief engineer's office at Louisville, Ky., as a draftsman, which position he held until his recent appointment, effective August 1.

Charles Thomas Kimbrough, whose retirement as supervisor of track on the Indiana Harbor Belt, with headquarters at Hammond, Ind., was reported in the July issue, was born at Lomax, Ill., on October 21, 1873, and entered railway service in April, 1888, as a water boy and timekeeper on the Iowa division of the Chicago, Burlington & Quincy. He later served as a bridge gang laborer and in April, 1896, he was promoted to section foreman. Four years later he was advanced to extra gang foreman and early in 1906 he went with the Union Pacific as a general foreman on the Nebraska division. In July, 1906, Mr. Kimbrough went with the Indiana Harbor Belt as a foreman at Gibson, Ind. He later served on that road and the New York Central as assistant general foreman at Kentland, Ind., general foreman at Calumet City, Ill., and roadmaster, general roadmaster and supervisor of track at Hammond, Ind.

W. R. Garrett, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Hannibal, Mo., was reported in the July issue, was born at Shenandoah, Iowa, on November

19, 1895, and entered railway service in June, 1913, as a section laborer on the Burlington at Essex, Iowa. On July 17, 1916, he was promoted to section foreman at Elliott, Iowa, and on March 1, 1927, he was transferred to Emerson, Iowa. He was promoted to extra gang foreman in October, 1927, and on October 1, 1930, he was transferred to Pacific Junction, Iowa, as yard foreman. Mr. Garrett was advanced to track supervisor at Chillicothe, Mo., on July 4, 1933, and on October 4, 1939, he was promoted to acting roadmaster at Craig, Mo. He returned to Chillicothe as track supervisor a few weeks later and on March 17, 1941, he was advanced to acting roadmaster on the Kansas City terminal and St. Joseph divisions at Kansas City, Mo., which position he held until his recent promotion.

John L. McElroy, whose retirement as roadmaster on the Chicago & North Western, with headquarters at Green Bay, Wis., was reported in the August issue, was born at Harvard, Ill., on October 27, 1876, and entered railway service as a roadmaster's clerk on the North Western at Belvidere, Ill., in July, 1890. In 1898 he was promoted to section foreman at Belvidere and on September 1, 1905, he went with the Union Pacific as assistant roadmaster at Lawrence, Kan. He returned to the North Western on March 19, 1907, as section foreman at Belvidere, and was later advanced to assistant roadmaster on the Chicago terminals. On April 16, 1928, he was advanced to roadmaster, with headquarters at Green Bay, Wis.

Raymond Charles Hager, whose promotion to supervisor of track on the New York Central, with headquarters at Kankakee, Ill., was reported in the July issue, was born at Elkhart, Ind., on October 18, 1897, and took a correspondence course in higher accounting. He entered railway service on February 1, 1916, as a clerk and accountant in the frog and switch shops of the New York Central at Elkhart. In 1920 he was transferred to the office of the supervisor of track at Elkhart in charge of accounting work and checking payroll expenditures. In 1922 he was appointed chief clerk to the supervisor of track at La Porte, Ind., and in 1927 he was appointed extra gang foreman at La Porte. In 1930 Mr. Hager was appointed instrumentman and later junior engineer in office of the division engineer at Chicago. In 1934 he was promoted to assistant supervisor of track on the New York Central at Kentland, Ind., where he remained, with the exception of temporary service on the Michigan Central at Michigan City, Ind., in 1940, until his recent promotion, which was effective June 1.

Michael C. Van Velkinburgh, whose retirement as roadmaster on the Chicago, Burlington & Quincy, with headquarters at Milan, Mo., was reported in the July issue, was born at New Hampton, Mo., on November 14, 1879, and entered railway service on May 1, 1900, as a section laborer on the Burlington at New Hampton. On January 1, 1905, he was promoted to section foreman at Derby, Iowa, and on February 20, 1912, he was transferred to New Hampton where he served as section foreman and extra gang foreman until May 12, 1918, when he was appointed general yard foreman at Kansas City, Mo. Mr. Van Velkinburgh was transferred back to New Hampton several months later and on July 15, 1922, he was advanced to assistant roadmaster on the St. Joseph division at Albany, Mo. On April 15, 1927, he was promoted to roadmaster at Albany and on November 15, 1929, he was transferred to Keokuk, Iowa. On April 1, 1932, he was appointed general yard foreman at St. Joseph, Mo., and on February 15, 1937, he was promoted to roadmaster at Centerville, Iowa. On September 1, 1939, Mr. Van Velkinburgh was transferred to Milan, where he remained until he retired because of ill health.

John R. Perkins, whose retirement as roadmaster on the Chicago, Rock Island & Pacific, with headquarters at Sibley, Iowa, was reported in the July issue, was born at Alledonia, Ohio, on March 25, 1876, and entered railway service on May 5, 1897, as a section laborer on the Mason City & Ft. Dodge (now part of the Chicago Great Western) at Clarion, Iowa. On February 1, 1899, he went with the Burlington, Cedar Rapids & Northern (now part of the Rock Island) as a section laborer at Clarion and on August 1, 1900, he was promoted to section foreman at Bricelyn, Minn. From May 15, 1906, to June 1, 1909, he served as section foreman and acting roadmaster at Estherville, Iowa, and on the latter date he went with the Minneapolis, St. Paul & Sault Ste. Marie as roadmaster at Kenmare, N. D. On July 1, 1911, he went with the Northern Pacific as a construction and extra gang foreman at St. Paul, Minn., and on September 12, 1912, he returned to the Rock Island as a construction foreman at Manly, Iowa. Mr. Perkins was promoted to roadmaster, with headquarters at Carlisle, Iowa, on March 1, 1913, and on September 1, 1923, he was transferred to Sibley, where he remained until his retirement, effective June 1.

Patrick James Melody, whose promotion to roadmaster on the Chicago, Burlington & Quincy, with headquarters at Milan, Mo., was reported in the July issue, was born at Grinnell, Iowa, on June 26, 1885, and entered railway service in September, 1913, as a section laborer on the Burlington. A year later he was promoted to section foreman on the Creston division and on April 29, 1915, he was advanced to extra gang foreman, serving in that capacity or as section foreman and yard foreman at Pacific Junction, Iowa, and Creston, Iowa, until September, 1923, when he was advanced to roadmaster, with headquarters at Creston. On December 1, 1930, he was appointed extra gang foreman and later served as general foreman on the St. Joseph (Mo.) terminal. In 1932 he was appointed a track supervisor on the Hannibal division and in 1934 he was appointed assistant roadmaster in charge of a system rail-laying gang. On April 1, 1939, he was appointed a track supervisor on the Ottumwa division. On August 26, 1940, Mr. Melody was appointed general foreman in charge of the removal of sections 2, 3 and 4 of the Quincy, Omaha & Kansas City (a Burlington subsidiary), returning to the Ottumwa division as track supervisor on December 15, 1940, which position he held until his recent promotion, effective July 1.

A. K. Howe, assistant supervisor of track on the Pennsylvania, with headquarters at Harrisburg, Pa., has been promoted to supervisor of track with headquarters at Wheeling, W. Va. **E. M. French,** an engineer on the Maryland division, has been promoted to supervisor of track, with headquarters at Buffalo, N.Y. **H. M. Curtiss,** assistant supervisor of track on the Middle division, has been advanced to supervisor of track, with headquarters at Kalamazoo, Mich. **J. T. Hartnett,** general foreman on the Erie and Ashtabula division, has been promoted to assistant supervisor of track at Northumberland, Pa., to succeed **C. H. Baker,** who has been promoted to supervisor of track at Harrisburg. **G. W. Dabbs,** assistant on the engineer corps of the Western region, has been appointed assistant supervisor of track, with headquarters at York, Pa., to replace **C. J. Grigg,** who has been transferred to Wilmington, Del., where he replaces **J. E. Chubb,** who has been transferred to West Philadelphia, Pa. **N. T. Patterson,** assistant supervisor of track at Cresson, Pa., has been transferred to Huntingdon, Pa. **W. T. Rice,** supervisor of track at Wheeling, W. Va., has been transferred to Logansport, Ind., and **N. L. Fleckenstine,** supervisor of track at Mt. Morris, N.Y., has been transferred to Piqua, Ohio.

Bridge and Building

A. W. Gobeli, roadmaster on the Atchison, Topeka & Santa Fe at La Junta, Colo., has been promoted to general foreman of bridges and buildings and water service, with headquarters at Clovis, N.M., a newly created position.

John Douglas, assisant scale inspector on the Denver & Rio Grande Western, has been promoted to scale inspector, with headquarters at Denver, Colo., succeeding **Ed. McLelland,** deceased, and **William K. Hunt** has been appointed assistant scale inspector, replacing Mr. Douglas.

W. C. Blackaller, assistant engineer on the Denver & Rio Grande Western at Salt Lake City, Utah, has been appointed acting master carpenter, with headquarters at Alamosa, Colo., succeeding **J. F. Zanolio,** whose appointment as acting division engineer at Grand Junction, Colo., is reported elsewhere in these columns.

L. P. Wilcoxson, pump repairman in the Cincinnati terminals of the Louisville & Nashville, has been promoted to assistant supervisor of bridges and buildings on the Eastern Kentucky division, with headquarters at Ravenna, Ky., succeeding **Thomas Clouse,** who has been transferred to the Pensacola subdivision of the M. & N. O. division.

Victor Ward Hutchings, whose promotion to supervisor of bridges and buildings of the San Joaquin division of the Southern Pacific, with headquarters at Bakersfield, Cal., was reported in the August issue, was born at Fresno, Cal., on April 13, 1900, and attended Occidental College for one year. He entered railway service on the Southern Pacific on December 5, 1923 and on May 6, 1929, was promoted to bridge and building foreman on the San Joaquin division at Bakersfield. On January 15, 1939, he was promoted to assistant supervisor of bridges and buildings on the

(Continued on page 630)

Don't submit to "or equal"

Insist on Genuine

BARRETT DUFF-NORTON TRACK JACKS

You know that Duff-Norton Jacks are absolutely dependable—are built to withstand the strenuous demands of track service—have every quality you ask for in track jacks. ¶ So, when you order track jacks, don't permit substitution—specify and *insist on getting* the railroad man's favorite GENUINE BARRETT DUFF-NORTON JACKS!

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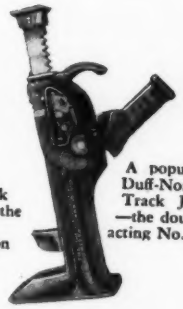
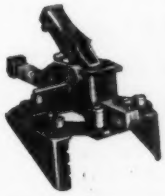
Every track crew needs the side-lift Duff-Norton No. 304.



A popular Duff-Norton Track Jack —the double-acting No. 110.



The Duff-Norton Tie Puller saves time and labor in tie-replacement.

Duff-Norton Inverted Bridge Jack —lightweight, powerful, fast.

Heavy-duty Duff-Norton Ball Bearing Screw Jack.

Surface and Lining Jack. Will handle heaviest rails.

The favorite of railroad men everywhere—the Duff-Norton Genuine Barrett No. 117 Track Jack.

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Tucson division and on April 1, 1939, he was transferred to the San Joaquin division.

John Dickerson, a bridge and building foreman on the Salt Lake division of the Union Pacific, has been appointed supervisor of bridges and buildings, with headquarters at Pocatello, Idaho, a newly created position. Mr. Dickerson was born at Scofield, Utah, on March 28, 1897, and entered railway service on April 26, 1915, as a bridge and building helper on the Los Angeles & Salt Lake (now part of the Union Pacific) at Caliente, Nev. In July, 1915, he was promoted to carpenter and in April, 1920, he was advanced to bridge and building foreman. He continued in this position, on the old L. A. & S. L. and the Salt Lake division of the Union Pacific, until his recent promotion.

Obituary

Charles N. Bainbridge, who retired in 1933 as engineer of design of the Chicago, Milwaukee, St. Paul & Pacific, with headquarters at Chicago, died at his home in Lombard, Ill., on July 1. Mr. Bainbridge graduated from Pennsylvania State College in 1907 and spent some time teaching surveying, hydraulics and structural engineering. In 1909 he went with the Milwaukee as a draftsman and was promoted to squad foreman in 1912. Two years later he was advanced to office engineer and in September, 1918, he was appointed assistant engineer of bridge maintenance. Three months later Mr. Bainbridge was appointed engineer of design, which position he held until his retirement.

Sheridan C. Tanner, who retired on April 1, 1938, as superintendent of the maintenance of way shop of the Baltimore & Ohio at Martinsburg, W. Va., died at his home in that city on April 2 after a long illness. Mr. Tanner was born at Custer Park, Ill., on February 20, 1865, and entered railroad service as a laborer on the Wabash in 1880. After working on a number of different railroads he entered service on the B. & O. at Chicago in 1890 and in September, 1895, he was appointed bridge and building foreman at Parkersburg, W. Va. On May 1, 1903, Mr. Tanner was promoted to master carpenter with headquarters at Parkersburg, and later served in this capacity at Cumberland, Md., and on the Baltimore division until January 16, 1921, when he was promoted to superintendent of the maintenance of way shops at Martinsburg, the position he held when he retired. Mr. Tanner has long been active in the American Railway Bridge and Building Association and in 1917-1918 was president of that organization.

William Davis Bagby, roadmaster on the St. Louis Southwestern, with headquarters at Malden, Mo., died at his home at that point on July 25. Mr. Bagby was born at Morris City, Ill., on May 11, 1875, and entered railway service on September 1, 1897, as a section laborer on the Cotton Belt at Holcomb, Mo. During the Spanish-American War he enlisted in the U. S. Army, and afterward studied for several months at Enfield, Ill. He returned to railroad service on September 20, 1899, as a section laborer for the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) at Morris City, and from October 15, 1900, to March 20, 1901, he taught school there. On April 1, 1901, he again became a section laborer on the Big Four and on March 9, 1902, he returned to the Cotton Belt as a section laborer at Malden. Three months later he was promoted to section foreman. On May 25, 1912, he went with St. Louis, Iron Mountain & Southern (now part of the Missouri Pacific) as roadmaster at Chester, Ill. He then went with the Missouri Pacific as a roadmaster and on February 24, 1918, he returned to the Cotton Belt as roadmaster at Illmo, Mo. On June 11, 1928, he was promoted to construction roadmaster on the building of the St. Francis Basin line and on the completion of this work he was appointed roadmaster at Malden, where he remained until his death.

Wilson S. Kinnear, retired consulting engineer, and at one time chief engineer of the Michigan Central and later president of the Kansas City Terminal Railway, died at Grosse Pointe, Mich., on August 8. Mr. Kinnear was born at Circleville, Ohio, on May 25, 1864, and attended Kansas State University. He entered railway service in 1883 as an axman on construction for the Atchison, Topeka & Santa Fe, later serving as a rodman, draftsman, levelman and transitman. In October, 1884, he went with the Kansas City, Clinton & Springfield (now part of the St. Louis-San Francisco) as a rodman and assistant engineer on construction and in April, 1885, he became assistant engineer maintenance of way on the Missouri Pacific at Kansas City, Mo. A year later he became division engineer and later office engineer on the Gulf, Colorado & Santa Fe and in August, 1887, he resigned to engage in the private practice of civil and hydraulic engineering at Los Angeles, Cal. In February, 1889, he went to Chile, South America, where he served at Santiago successively as office engineer, assistant engineer and acting chief engineer of the North and South American Construction Co. He returned to railroad service in the United States a year later as an assistant engineer maintenance of way on the Michigan Central (now part of the New York Central system) and in April, 1895, he was appointed supervising engineer on the construction of the Toronto, Hamilton & Buffalo (now jointly controlled by the New York Central and the Canadian Pacific) at Hamilton, Ont. Mr. Kinnear returned to the Michigan Central in September, 1901, as assistant superintendent of the Canada division and in July, 1902, he was advanced to assistant general superintendent. Two months later he was appointed chief engineer and in April, 1905, he was promoted to assistant general manager, with headquarters as before at Detroit, Mich. He was also appointed chief engineer of the Detroit River Tunnel Co. during the construction of the Michigan Central tunnels under the Detroit river. In August, 1910, Mr. Kinnear left the Michigan Central to become president of the Kansas City Terminal and in April, 1912, he left that company to become president of the United States Realty & Improvement Co., New York. He later organized and became senior partner of W. S. Kinnear & Co., consulting engineers, New York.

Association News

Railway Tie Association

To fill vacancies, the Executive committee has elected David W. Bauer (vice-president of the Potosi Tie & Lumber Company, St. Louis, Mo.) vice-president, and A. E. Whitehurst (general manager of American Creosote Works, Inc., Jackson, Tenn.) a director of the association.

Wood-Preservers' Association

A. M. Deiters, plant manager for the Southern Wood Preserving Company at Atlanta, Ga., has been appointed chairman of Committee 5-1, Oak Ties and Lumber, Pressure Treatment. **W. P. Whyland, Jr.,** of the Western Electric Company, New York City, has been appointed chairman of Committee 5-5-1, Poles, Pressure Treatment.

The Executive Committee will meet at the Hotel Stevens, Chicago, on October 15.

Track Supply Association

Fifty-four exhibitors have now arranged to take 79 spaces for the display of their products at the Hotel Stevens, Chicago, on September 16-18, coincident with the fifty-sixth annual convention of the Roadmasters and Maintenance of Way Association. In addition to the companies reported, the Railway Maintenance Corporation, Pittsburgh, Pa., and the Mississippi Supply Company, Chicago, will exhibit.

Further applications for space should be addressed to Lew Thomas, secretary, c/o Q & C Company, 59 East Van Buren street, Chicago.

Bridge and Building Association

The program for the fiftieth annual convention, which will be held at the Hotel Stevens, Chicago, on October 14-16, is rapidly nearing completion. Like the Roadmasters Association, the officers of this association are endeavoring to develop a program that will meet the more exacting needs of bridge and building men during the period of stress which they are now entering. Special recognition will also be given the fiftieth anniversary of this association in a session on Tuesday evening, at which the achievements of the organization in its half century's operation will be reviewed.

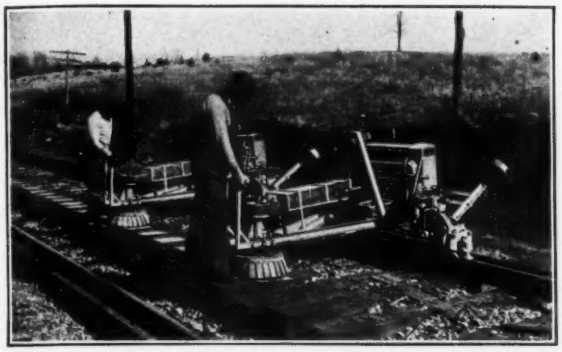
American Railway Engineering Association

The Board of Direction met in Chicago on August 20 to pass upon the budget to be submitted to the Association of American Railroads for appropriations for research and other work to be carried out under the direction of the Engineering division of the A. A. R. during 1942. The General committee of the Engineering division, A. A. R., met in Chicago on the following day to receive and pass upon the budget of the A. R. E. A. and to transact other business of the division.

The Board of Direction has tentatively

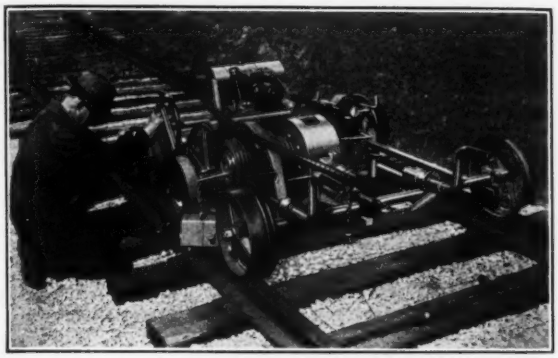
(Continued on page 632)

Nordberg Power Tools Were Developed For Your Maintenance Jobs



When Laying Rail

Twelve years ago, Nordberg developed the first of its line of power tools used for rail laying work. Today, efficient rail laying organizations are equipped with Nordberg Tools for such operations as adzing ties, pulling spikes, removing old track bolts and bolting up the new rail. These tools save time and labor and improve the quality of work.



For Reconditioning Rail

The reconditioning of rail ends is another maintenance operation for which Nordberg has developed a complete line of specially designed grinders to do an improved job of grinding. These include a heavy duty grinder, a light weight model for working in congested traffic areas, and several cup wheel grinders where extreme accuracy is essential.

Normal Maintenance

For other maintenance jobs, such as periodical joint tightening, there is also the Power Track Wrench; for ballasting, the Power Jack; and several types of grinders for reconditioning frogs, crossings, etc., removing flow at switch points and stock rails, slotting rail ends, equalizing height of cropped rail, etc.

TRACK SUPPLY ASS'N.
EXHIBITOR
ROADMASTERS CONVENTION

See Nordberg Power Tools on display at the Roadmasters Show, September 15-18, Hotel Stevens, Chicago. Let us acquaint you with the new tools we have developed for your jobs.

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scheduled its next meeting during the week of November 10, in conjunction with the open meeting that the A. A. R. will hold in Chicago during that week. It is expected that the Nominating committee will meet at the same time.

Three committees met during August, including the following: Records and Accounts, at Boston, Mass., on August 20 and 21; Water Service, Fire Protection and Sanitation, at Chicago, on August 26; and Buildings, at Toronto, Ont., on August 26 and 27.

Nine other committees plan meetings during September, six to be held in Chicago concurrent with the Roadmasters' convention to afford the members of the committees opportunity to attend sessions of the convention and to visit the exhibit of the Track Supply Association to be held in conjunction therewith. The committees which are to meet in September include the following: Uniform General Contract Forms, at New York, on September 8; Highways, at Chicago, on September 16; Economics of Railway Labor, at Chicago, on September 16; Maintenance of Way Work Equipment, at Chicago, on September 16 and 17; Rail, at Chicago, on September 17; Track, at Chicago, on September 18; Economics of Railway Location and Operation, at Chicago, on September 24 and 25; and Yards and Terminals, at Richmond, Va., on September 29 and 30.

Bridge and Building Supply Men's Association

Although invitations were sent to manufacturers only a month ago, 22 firms have already made applications for space at the exhibit which will be presented at the Hotel Stevens, Chicago, concurrently with the convention of the American Railway Bridge and Building Association on October 14-16. These companies have applied for more space than was used by all exhibitors last year, thereby already insuring the success of the exhibit. The companies which have arranged for space are:

Air Reduction Sales Co., New York.
American Lumber & Treating Co., Chicago.
Armco Railroad Sales Co., Inc., Middletown, Ohio.
Buda Co., Harvey, Ill.
Celotex Co., Chicago.
Dearborn Chemical Co., Chicago.
Paul Dickinson, Inc., Chicago.
Joseph Dixon Crucible Co., Jersey City, N.J.
Johns-Manville Corp., New York
Lehon Co., Chicago.
Mall Tool Co., Chicago.
Massey Concrete Products Co., Chicago.
National Lead Co., New York.
Oxweld Railroad Service Corp., Chicago.
Sherwin-Williams Co., Cleveland, Ohio.
Railway Engineering and Maintenance, Chicago.
T. W. Snow Construction Co., Chicago.
Stanley Works, The, New Britain, Conn.
Timber Engineering Co., Washington, D.C.
U. S. Wind Engine & Pump Co., Batavia, Ill.
Wailes-Dove-Hermiston Co., Westfield, N.J.
Wood Preserving Division, Koppers Co., Pittsburgh, Pa.

Further applications for space should be addressed to R. Y. Barham, secretary, c/o Armco Railroad Sales Company, Inc., 310 South Michigan building, Chicago.

Roadmasters Association

The program is now completed for the fifty-sixth annual convention, which will be held at the Hotel Stevens, Chicago, on September 16-18. In developing this program, the officers have endeavored to key it in with the acute problems that are now confronting track maintenance officers. With this objective, the reports of committees will be supplemented by addresses dealing with materials, labor, eliminating interference with traffic, and other topics of special importance at the present time. In further development of this policy, the association will remain in session Thursday afternoon, supplanting the inspection trip normally held at this time. The program follows:

Tuesday, September 16

Morning Session—10:00 A. M.

Convention called to order
Invocation
Opening address by C. H. Buford, vice-president, Operations and Maintenance Division, Association of American Railroads, Washington, D. C.
Greetings from the American Railway Engineering Association, F. L. C. Bond (vice-president and general manager, C. N.), President
Greetings from the American Railway Bridge and Building Association, H. M. Church (general supervisor bridges and buildings, C. & O.), President
Greetings from the Track Supply Association, E. C. Argust (vice-president and secretary, Morden Frog & Crossing Works), President
Address by President J. J. Clutz (division engineer, Penna., Indianapolis, Ind.)
Report of Committee on Rail-End Wear—Causes and Corrections; C. W. Baldridge, chairman (assistant engineer, A. T. & S. F., Chicago)

Afternoon Session—2:00 P. M.

Report of Committee on Roadway Machines—Off-Track vs. On-Track Types; A. L. Kleine, chairman (division engineer, D. & R. G. W., Salt Lake City, Utah)
Address on The Use of Cars and Locomotives by Maintenance of Way Forces in Times of Maximum Traffic Demands, by B. R. Kulp, chief engineer, C. & N. W., Chicago
Adjourn at 4:00 P. M. to visit exhibit of Track Supply Association

Wednesday, September 17

Morning Session—9:30 A. M.

Report of Committee on Gravel Ballast—Its Requirements and Preparation; E. J. Brown, chairman (district engineer maintenance, C. B. & Q., Galesburg, Ill.)
Address on Men—How We Can Meet the Requirements of an Expanding Program in a Period of Widespread Industrial Activity, by Fred S. Schwinn, assistant chief engineer, M. P., Houston, Tex.
Report of Committee on Recent Developments in the Renewal of Ties; F. G. Campbell, chairman (assistant chief engineer, E. J. & E., Joliet, Ill.)

Afternoon Session—2:00 P. M.

Address on What We Face in Materials, by E. A. Clifford, chief purchasing officer, C. & N. W., Chicago
Address on What We Face in Equipment, by G. R. Westcott, assistant engineer, M. P., St. Louis, Mo.
Address on What We Can Do About It, by H. R. Clarke, engineer maintenance of way, C. B. & Q., Chicago
Adjourn at 4:00 P. M. to visit exhibit of Track Supply Association

Wednesday Evening—6:30 P. M.

Annual dinner given by the Track Supply Association

Thursday, September 18

Morning Session—9:30 A. M.

Report of Committee on Present-Day Roadway Drainage Requirements; W. B. Bailes, chairman (supervisor, Southern, Charlottesville, Va.)
Address on Streamlining Our Maintenance of Way Practices to Meet the Conditions of a Defense Era, by A. E. Perlman, chief engineer, D. & R. G. W., Denver, Colo.
Report of Committee on Maintaining Right-of-Way Fences—Organization and Methods; F. J. Meyer, chairman (roadmaster, N. Y. O. & W., Middletown, N. Y.)

Afternoon Session—1:00 P. M.

Summing Up—A review of the constructive ideas developed during the convention, by G. L. Sitton, chief engineer, maintenance of way and structures, Eastern region, Southern, Charlotte, N. C.
Closing Business

(All sessions will be held on Chicago Daylight Saving Time—One Hour Later Than Central Standard Time.)

Trade Publications

Vibratory Material Handling Equipment.—The Syntron Company, Homer City, Pa., has published catalog 416 describing its complete line of vibratory equipment for material handling work, including electric vibrators for concrete forms, electric hammers and various types of vibrators for hoppers and chutes. The catalog contains 48 pages, is printed in color and is attractively illustrated with numerous photographs.

New Wire Rope Catalog.—The Macwhyte Company, Kenosha, Wis., has published a new wire rope catalog of convenient handbook size, known as catalog G-14, which has been increased in size from 112 pages to 170 pages. The catalog, which is well illustrated, lists more than 1000 ropes for all types of industrial and equipment needs and sixty pages of general information have been added. The information is conveniently organized and clearly presented. A tabled index, for quick reference, and a glossary of every-day wire rope terms are also provided.

Mall Tools.—Form No. 212, an eight-page bulletin, has been published by the Mall Tool Company, Chicago, to describe the line of contractor's equipment manufactured by this company. Included in the descriptions are gasoline engine, air and electric motor-powered concrete vibrators and concrete surfacers, portable electric drills, and portable gasoline engine, pneumatic and electric powered chain and circular saws. Action photographs are shown, of work on which the various types of equipment are employed, and detailed descriptions of their uses and capacities are presented.

Before engineers of the Big Four Railroads specified prefabricated timber, jointed by TECO Connectors, for the roof trusses in the Bellfountaine, Ohio, round house, they made this important test:

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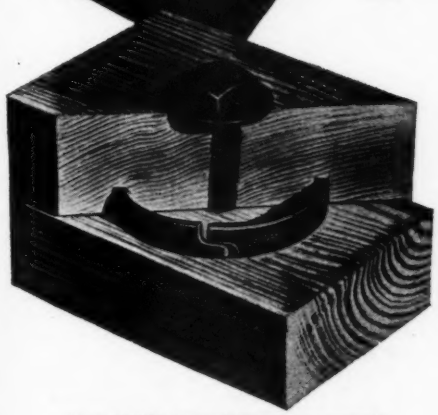
OK!

Members of one complete truss joint were cut to exact shape and bored with all necessary holes and grooves. The timbers were then creosoted according to American Creosoting Company standards for railroad timbers. This test demonstrated that no hindering irregularity, due to swelling, resulted from the creosoting treatment . . . proof that this faster, more economical method of timber construction can be widely used in railroad work. Another railway maintenance economy!

Prefabricated timber with TECO Connector construction is today's answer to engineering demands for speed, economy, and durability in railway structures. 52 railways say so!



The TECO Ring Connector spreads the load on a timber joint over practically the entire cross-section of the wood . . . brings the full structural strength of lumber into play.

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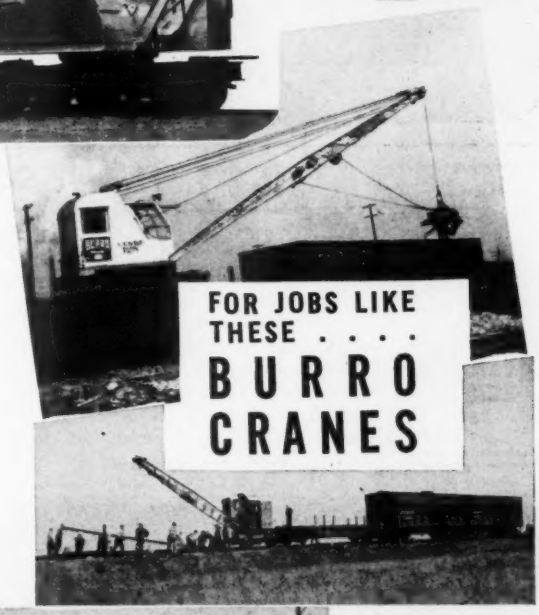
BURRO CRANES ARE BUILT . . .

Rear end of cab with doors and radiator shutter open. Note easy access to engine.

View of rear end of cab with doors closed.



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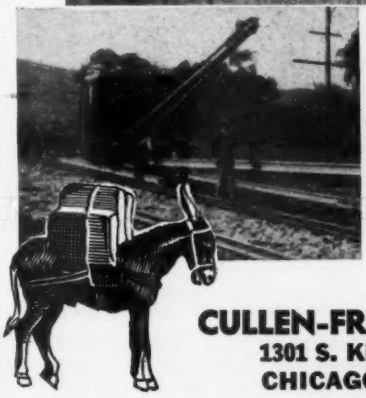

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OXWELD METHODS..

At Exhibit Area 84-85, Track Supply Association
Stevens Hotel, Chicago, September 15-18

WHEN you come to the Roadmasters' Convention, visit the Oxweld exhibit shown above. Here you will find Oxweld engineers and field representatives, the men who are actually engaged in organizing and supervising Oxweld procedures in maintenance-of-way work. They will be glad to discuss with you the use of such Oxweld methods as pressure butt-welding of rails, flame-hardening of rail ends in track, and other oxy-acetylene applications. Plan to attend! The useful information which you can obtain about these and other Oxweld procedures will make it worth your while.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation

UCC
Carbide and Carbon Building — Chicago and New York

OXWELD RAILROAD SERVICE

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

The word "Oxweld" is a registered trade-mark of a Unit of Union Carbide and Carbon Corporation.

Sheffield

MODEL 53

For a Full Section Crew and Their Tools

—HAS THE CLUTCH THAT YOU CAN'T BURN OUT!

HERE'S the newest model in a famous line — a lightweight standard section car weighing only 929 pounds.

Despite its capacity, the new Sheffield 53 is light enough *for one man to handle.* 125-pound rear-end lifting weight. And it is sturdy, safe, powerful, and *dependable.*

Not just one or two good features recommend it to you . . . it has good design and rugged, precise construction throughout. Thus it fully maintains the standards that have kept Sheffields the leaders since the day 44 years ago when Sheffield introduced motor cars to railroading.

There's a full line of Sheffield Motor Cars for every railroad need. Write for complete details and specifications. Fairbanks, Morse & Co., Dept. I70, 600 S. Michigan Ave., Chicago, Ill.

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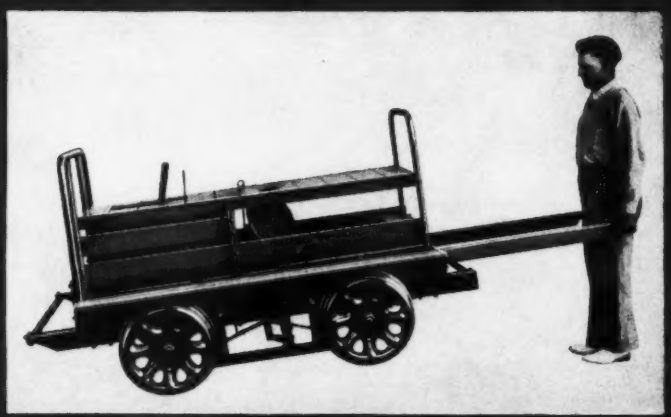
Instruction books and parts lists on any Fairbanks-Morse railroad equipment will gladly be sent on request.

MOTOR CAR

First on the Rails and *Still First*



One man can lift Sheffield Model 53 on and off the rails. Extension handles and the safety rails pictured are standard equipment.

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